"N-O Chemistry for Antibiotics: Discovery of *N*-Alkyl-*N*-(pyridin-2-yl)hydroxylamine Scaffolds as Selective Antibacterial Agents Using Nitroso Diels-Alder and Ene Chemistry"

Supporting Information

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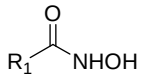
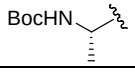
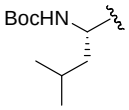
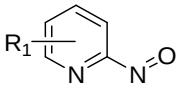
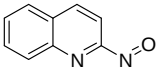
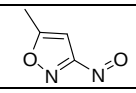
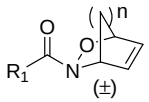
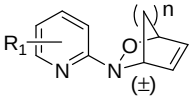
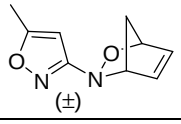
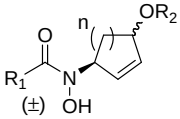
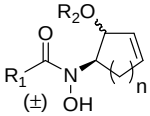
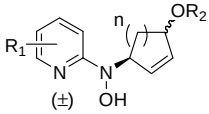
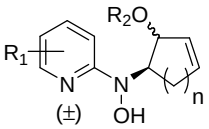
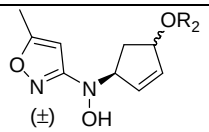
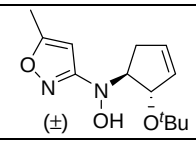
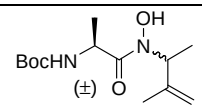
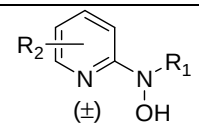
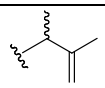
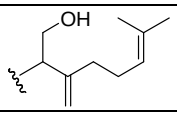
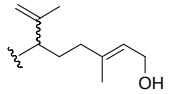
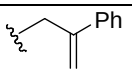
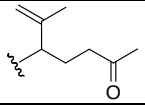
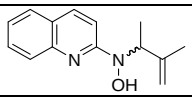
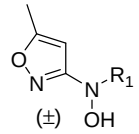
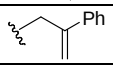
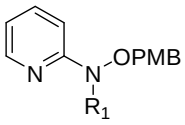
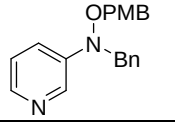
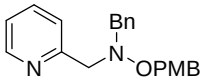
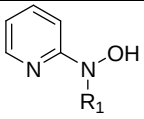
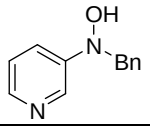
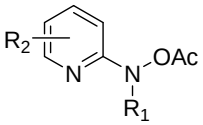
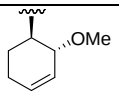
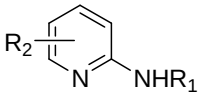
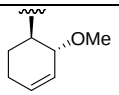
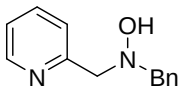
I. Table of All Structures From This Work

Table S1. Structures and antibacterial activity against *Micrococcus luteus* ATCC 10240 in the agar diffusion assay.

Library[a]	Structure[b]	Comp.[c]	n	syn/anti[d]	R_1	R_2	Ref.[e]	Active?[f]
A Nitrosos & Precursors		**S1**	-	-	Bn	-	4	No
		S2	-	-	Ph	-	4	No
		S3	-	-	*t*-BuO	-	4	No
		S4	-	-		-	4	No
		S5	-	-		-	4	No
		**8**	-	-	6-Me	-	4	No
		10	-	-	H	-	4	nt
		17a	-	-	6-Et	-	4	No
		17b	-	-	4-Me	-	4	No
		17c	-	-	3-Me	-	4	Yes[g]
		17d	-	-	5-Cl	-	4	No
		17e	-	-	5-Br	-	4	No
		17f	-	-	5-I	-	4	No
		17g	-	-	3-Cl-5-Cl	-	4	No
		17h	-	-	5-Br-6-Me	-	4	No
		17i	-	-	3-Cl-5-CF_3	-	4	No
		**13**	-	-	-	-	4	No
		**15**	-	-	-	-	4	No
B Diels-Alder Cycloadducts		**S6**	1	-	Bn	-	4	No
		S7	2	-	Bn	-	4	No
		S8	-	-	Ph	-	4	No
		S9	1	-	*t*-BuO	-	4	No
		**6**	2	-	5-Br	-	1,4	No
		S10	1	-	5-Cl	-	1,4	No
		S11	1	-	5-Br	-	1,4	No
		S12	1	-	6-Me	-	1,4	No
		S13	2	-	6-Me	-	1,4	No
		**S14**	-	-	-	-	1,4	No
C Ring Opened Compounds		**S15**	1	anti	Bn	Me	3,4	No
		S16	1	anti	Bn	*t*-Bu	3,4	No
		S17	1	anti	*t*-BuO	Me	3,4	No
		S18	2	anti	Bn	Me	3,4	No
		**S19**	1	anti	*t*-BuO	Me	3,4	No
		S20	2	anti	Bn	Me	3,4	No
		**7a**	2	anti	5-Br	Me	1,4	Yes
		S21	1	syn/anti	5-Cl	*i*-Pr	1,4	Yes
		S22	1	syn/anti	5-Cl	*t*-Bu	1,4	Yes
		S23	1	syn	5-Br	H	1,4	Yes

		S24	1	anti	5-Br	H	1,4	Yes
		S25	1	syn/anti	5-Br	Me	1,4	Yes
		S26	1	syn/anti	5-Br	*i*-Pr	1,4	Yes
		S27	2	anti	5-Br	*i*-Pr	1,4	Yes
		S28	1	syn/anti	5-Br	*t*-Bu	1,4	Yes
		S29	2	anti	5-Br	*t*-Bu	1,4	Yes
		S30	2	anti	5-Br	allyl	1,4	Yes
		S31	1	syn/anti	6-Me	Me	1,4	Yes
		S32	1	syn/anti	6-Me	*i*-Pr	1,4	Yes
		S33	2	anti	6-Me	*i*-Pr	1,4	Yes
		S34	1	anti	6-Me	*t*-Bu	1,4	Yes
		S35	2	anti	6-Me	*t*-Bu	1,4	Yes
		**7b**	2	anti	5-Br	Me	1,4	Yes
		S36	1	anti	5-Cl	Me	1,4	Yes
		S37	1	anti	5-Cl	*t*-Bu	1,4	Yes
		S38	1	anti	5-Br	H	1,4	Yes
		S39	2	anti	5-Br	H	1,4	Yes
		S40	1	anti	5-Br	Me	1,4	Yes
		S41	1	anti	5-Br	*i*-Pr	1,4	Yes
		S42	2	anti	5-Br	*i*-Pr	1,4	Yes
		S43	2	anti	5-Br	*t*-Bu	1,4	Yes
		S44	2	anti	5-Br	Bn	1,4	Yes
		S45	2	anti	5-Br	allyl	1,4	Yes
		S46	1	anti	6-Me	Me	1,4	Yes
		S47	2	anti + 1,4-anti isomer	6-Me	Me	1,4	Yes
		S48	1	anti	6-Me	*i*-Pr	1,4	Yes
		S49	2	anti	6-Me	*i*-Pr	1,4	Yes
		S50	2	anti	6-Me	*t*-Bu	1,4	Yes
		**S51**	-	syn/anti	-	Me	1,4	No
		S52	-	syn/anti	-	^{t}Bu	1,4	No
		**S53**	-	anti	-	-	1,4	No
D Ene Products		**S54**	-	-	-	-		No
		**9**	-	-		6-Me	2,4, This Work	Yes
		12	-	-		H	2,4	Yes
		18a	-	-		6-Et	This Work	Yes
		18b	-	-		4-Me	This Work	Yes
		18c	-	-		3-Me	This Work	Yes
		18d	-	-		5-Cl	4, This Work	Yes
		18e	-	-		5-Br	2,4, This Work	Yes
		18f	-	-		5-I	This Work	Yes

		18g	-	-		3-Cl-5-Cl	This Work	Yes
		18h	-	-		5-Br-6-Me	This Work	Yes
		18i	-	-		3-Cl-5-CF_3	This Work	No
		S55	-	-		5-Br	2,4	Yes
		11a	-	-		H	2,4, This Work	Yes
		S56	-	-		5-Br	2,4	Yes
		40a	-	-		6-Et	This Work	Yes
		19a	-	-		H	This Work	Yes
		19b	-	-		H	This Work	Yes
		19c	-	-		H	This Work	Yes
		**14**	-	-	-	-	This Work	Yes
		**16**	-	-		-	2,4	Yes
		S57	-	-		-	2,4	Yes
		S58	-	-		-	2,4	Yes
		S59	-	-		-	2,4	Yes
E *O*-Alkyl-Hydroxyl-Amines		**30a**	-	-	Me	-	This Work	No
		30b	-	-	Pr	-	This Work	No
		30c	-	-	*n*-hexyl	-	This Work	No
		30d	-	-	Bn	-	This Work	No
		30e	-	-	$(CH_2)_2Ph$	-	This Work	No
		30f	-	-	allyl	-	This Work	No
		30g	-	-	3-(PhO)Bn	-	This Work	No
		30h	-	-	4-(CF_3)Bn	-	This Work	No
		30i	-	-	4-(CF_3O)Bn	-	This Work	No
		**36**	-	-	-	-	This Work	Yes
		**38**	-	-	-	-	This Work	No
F Buchwald Hydroxyl-Amines		**31a**	-	-	Me	-	This Work	Yes
		31b	-	-	Pr	-	This Work	No
		31c	-	-	*n*-hexyl	-	This Work	Yes
		31d	-	-	Bn	-	This Work	Yes

		31e	-	-	$(CH_2)_2Ph$	-	This Work	Yes
		31f	-	-	allyl	-	This Work	Yes
		31g	-	-	3-(PhO)Bn	-	This Work	No
		31h	-	-	4-(CF_3)Bn	-	This Work	Yes
		31i	-	-	4-(CF_3O)Bn	-	This Work	Yes
		**37**	-	-	-	-	This Work	Yes
G *O*-Acyl-Hydroxyl-Amines		**33**	-	-	Bn	H	This Work	Yes
		35	-	-		Br	This Work	Yes
H N-O Reduced Compounds		**32**	-	-	Bn	H	This Work	No
		34	-	-		Br	This Work	No
I Homologated Hydroxyl-Amines		**39**	-	-	-	-	This Work	No

[a]Compound library is organized by types of structures (**A–I**) rather than compound numbers.
[b](±) denotes a racemic compound (all compounds were tested in racemic form).
[c]Compounds only appearing in the supporting information are denoted with a capital **S** before the number and are numbered based on chronological appearance in Table S1. If a compound was used in main text, the original compound number assigned in the main text was retained throughout the supporting information.
[d]Some compounds, as indicated in the table, were isolated, characterized, and tested as a mixture of syn/anti diastereomeric mixtures of isomers.
[e]Reference contains disclosure of the original synthesis of the compound and spectral characterization.
[f]Indicates antibacterial activity against *Micrococcus luteus* ATCC 10240 in the agar diffusion antibacterial susceptibility assay. "Yes" denotes that the compound gave a growth inhibition zone diameter of >15 mm; "No" denotes that the compound gave a growth inhibition zone diameter of ≤15 mm; "nt" denotes that the compound was not tested. All of the tabulated biological data is given in Table S2.
[g]This was the only nitroso compound with moderate activity. See Table S2.

II. Table of All Biological Data From This Work

Table S2. Complete list of biological data for compounds used in this study. Diameters of growth inhibition zones (mm) in the agar diffusion antibacterial susceptibility assay.[a] Minimum inhibitory concentrations (MIC_{90}; μM) in the broth microdilution antibacterial susceptibility assay.[b] Inhibitory concentrations (IC_{50}; μM) and percent growth inhibition values (compound concentration of 20 μM) against cancer cell lines.[c]

Comp[d]	**Gram-positive Bacteria** (diameter of growth inhibition zone in mm; MIC_{90} in μM given in parentheses)				**Gram-negative Bacteria** (diameter of growth inhibition zone in mm)			**Yeast** (diameter of zone in mm)	**Cancer Cell Lines** (% Inhibition @ 20 μM; IC_{50} in μM given in parentheses)		
	M. luteus ATCC 10240	*S. aureus* SG511	*E. faecalis* ATCC 49532	*M. vaccae* IMET 10670	*P. aeruginosa* 799/WT	*P. aeruginosa* 799/61	*E. coli* X580	*S. salmonicolor* 549	MCF7	PC3	HeLa
6	0	0	0	0	nt	0	0	nt	nt	nt	nt
7a	34 (4.0 μM)	12 (>128μM)	16P (>128 μM)	17p	nt	0	0	nt	33%	32%	25%
7b	34 (4.0 μM)	18p (≥128 μM)	20P (>128 μM)	22s	nt	0	0	nt	nt	nt	nt
8	0	0	0	0	0	0	0	nt	nt	nt	nt
9	48 (4.0 μM)	12 (>128μM)	15P (>128 μM)	20P	nt	0	0	nt	11%	24%	0%
10	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
11a	35 (8.0 μM)	19 (64 μM)	20P (>128 μM)	16p	nt	0	18h	nt	57%	35%	31%
12	31 (8.0 μM)	18 (128 μM)	22P (>128 μM)	nt	nt	nt	nt	nt	50%	14%	25%
13	9.5	0	0	nt	nt	nt	nt	nt	nt	nt	nt
14	31 (8.0 μM)	13 (128 μM)	13P/h (>128 μM)	nt	nt	nt	nt	nt	76% (15μM)	17%	41%

15	0	0	0	0	0	0	0	nt	nt	nt	nt
16	21 (64 μM)	0 (>128 μM)	13P (>128 μM)	0	nt	nt	nt	nt	10%	28%	34%
17a	14	11	0	nt	nt	nt	nt	nt	nt	nt	nt
17b	14	9.5	12h	nt	nt	nt	nt	nt	nt	nt	nt
17c	17	15	116p	nt	nt	nt	nt	nt	nt	nt	nt
17d	11.5p	0	nt	9.5	nt	nt	nt	nt	nt	nt	nt
17e	11/13p	9.5/12P	nt	10	nt	nt	nt	nt	nt	nt	nt
17f	14	11	9.5	nt	nt	nt	nt	nt	nt	nt	nt
17g	9.5	0	0	nt	nt	nt	nt	nt	nt	nt	nt
17h	15	12	0	nt	nt	nt	nt	nt	nt	nt	nt
17i	0	0	17	nt	nt	nt	nt	nt	nt	nt	nt
18a	52 (2.0 μM)	11/20h (>128 μM)	22P/h (>128 μM)	nt	nt	nt	nt	nt	22%	11%	13%
18b	29 (4.0 μM)	20 (128 μM)	22P (>128 μM)	nt	nt	nt	nt	nt	74% (12μM)	17%	37%
18c	25 (16 μM)	10 (>128 μM)	19P/h (>128 μM)	nt	nt	nt	nt	nt	nt	nt	nt
18d	40 (2.0 μM)	18 (128 μM)	15/21P (≥128 μM)	nt	nt	nt	nt	nt	68% (14μM)	0%	18%
18e	35 (4.0 μM)	17P (>128 μM)	19P (>128 μM)	26s	nt	nt	nt	nt	70% (10μM)	12%	19%
18f	38 (2.0 μM)	12 (>128 μM)	19P/h (>128 μM)	nt	nt	nt	nt	nt	75% (8 μM)	17%	15%
18g	27 (16 μM)	0 (>128 μM)	14P (>128 μM)	nt	nt	nt	nt	nt	29%	20%	24%

18h	35 (4.0 μM)	13 (>128 μM)	12P (>128 μM)	nt	nt	nt	nt	nt	19%	0%	21%
18i	15 (128 μM)	0 (>128 μM)	13P (>128 μM)	nt	nt	nt	nt	nt	20%	13%	30%
19a	33 (4.0 μM)	15 (128 μM)	18P (>128 μM)	nt	nt	nt	nt	nt	63%	20%	3%
19b	20 (64 μM)	19 (32 μM)	18P (>128 μM)	nt	nt	nt	nt	nt	nt	nt	nt
19c	30 (16 μM)	15p (128 μM)	16P (>128 μM)	nt	nt	nt	nt	nt	49%	24%	37%
30a	0	0	0	0	nt	nt	nt	nt	nt	nt	nt
30b	0	0	0	nt	nt	nt	nt	nt	nt	nt	nt
30c	13P/h	0	0	nt	nt	nt	nt	nt	nt	nt	nt
30d	0 (>128 μM)	0 (>128 μM)	0 (>128 μM)	nt	nt	nt	nt	nt	nt	nt	nt
30e	0	0	0	nt	nt	nt	nt	nt	nt	nt	nt
30f	0	0	0	nt	nt	nt	nt	nt	nt	nt	nt
30g	0	0	0	nt	nt	nt	nt	nt	nt	nt	nt
30h	14P	0	0	nt	nt	nt	nt	nt	nt	nt	nt
30i	14P	0	0	nt	nt	nt	nt	nt	nt	nt	nt
31a	18p/24P (≥128 μM)	14h (>128 μM)	11P/h (>128 μM)	nt	nt	nt	nt	nt	90% (17μM)	63% (15μM)	97% (17μM)
31b	13p (>128 μM)	0 (>128 μM)	0 (>128 μM)	nt	nt	nt	nt	nt	nt	nt	nt
31c	15 (128 μM)	17p (>128 μM)	16P (>128 μM)	nt	nt	nt	nt	nt	nt	nt	nt

31d	24 (64 μM)	18 (128 μM)	20P (>128 μM)	15	0	0	0	nt	0%	0%	10%
31e	16 (128 μM)	14h (>128 μM)	15 (>128 μM)	nt	nt	nt	nt	nt	nt	nt	nt
31f	14 (>128 μM)	0 (>128 μM)	12P (>128 μM)	11P	0	0	0	nt	nt	nt	nt
31g	12p/P (>128 μM)	13 (>128 μM)	0 (>128 μM)	14	0	0	12	nt	nt	nt	nt
31h	16 (128 μM)	15s (>128 μM)	15 (>128 μM)	nt	nt	nt	nt	nt	nt	nt	nt
31i	17/21h (128 μM)	14h (>128 μM)	15P (>128 μM)	nt	nt	nt	nt	nt	nt	nt	nt
32	0 (>128 μM)	0 (>128 μM)	0 (>128 μM)	0	0	0	0	nt	nt	nt	nt
33	20 (128 μM)	12 (>128 μM)	11P (>128 μM)	0	0	0	0	nt	nt	nt	nt
34	0 (>128 μM)	0 (>128 μM)	0 (>128 μM)	0	nt	nt	nt	nt	nt	nt	nt
35	22 (32 μM)	0 (>128 μM)	0 (>128 μM)	0	nt	0	0	nt	nt	nt	nt
36	24	15	0	23	0	11P	0	nt	nt	nt	nt
37	15p (≥128 μM)	16p (>128 μM)	0 (>128 μM)	12P/h	0	13P	0	nt	nt	nt	nt
38	14P	13	0	nt	nt	nt	nt	nt	nt	nt	nt
39	0 (>128 μM)	0 (>128 μM)	0 (>128 μM)	0	0	0	0	nt	nt	nt	nt

40a	31 (2.0 μM)	18P (>128 μM)	19.5P (>128 μM)	nt	nt	nt	nt	nt	nt	nt	nt
S1	0	0	0	0	0	0	0	nt	nt	nt	nt
S2	0	0	0	nt	nt	nt	nt	nt	nt	nt	nt
S3	0	0	0	0	0	0	0	nt	nt	nt	nt
S4	0	0	0	0	0	0	0	nt	nt	nt	nt
S5	0	0	0	0	0	0	0	nt	nt	nt	nt
S6	0	0	nt	0	nt	nt	nt	nt	nt	nt	nt
S7	0	0	nt	0	nt	nt	nt	nt	nt	nt	nt
S8	0	0	0	nt	nt	nt	nt	nt	nt	nt	nt
S9	0	0	nt	0	nt	nt	nt	nt	nt	nt	nt
S10	11/15p/17P	10/15P	nt	12h	nt	nt	nt	nt	nt	nt	nt
S11	15.5	0	nt	0	nt	0	0	nt	nt	nt	nt
S12	17P	9.5/11P	nt	0	nt	0	0	nt	nt	nt	nt
S13	0	0	nt	0	nt	nt	nt	nt	nt	nt	nt
S14	0	0	nt	0	nt	nt	nt	nt	nt	nt	nt
S15	0	0	nt	0	nt	nt	nt	nt	nt	nt	nt
S16	0	0	nt	0	nt	nt	nt	nt	nt	nt	nt
S17	0	0	nt	0	nt	nt	nt	nt	nt	nt	nt
S18	12h	0	nt	15P/h	nt	nt	nt	nt	nt	nt	nt
S19	0	0	nt	0	nt	nt	nt	nt	nt	nt	nt
S20	0	0	nt	0	nt	nt	nt	nt	nt	nt	nt
S21	29	10P	nt	14p	nt	nt	nt	nt	nt	nt	nt
S22	28	12p	nt	14p	nt	nt	nt	nt	nt	nt	nt
S23	25.5	9.5p	nt	0	nt	nt	nt	nt	nt	nt	nt
S24	26.5	0	nt	0	nt	nt	nt	nt	nt	nt	nt

S25	30	11/12p	nt	15p/18P	nt	0	0	nt	nt	nt	nt
S26	27	12.5p	nt	15p	nt	nt	nt	nt	nt	nt	nt
S27	23	0	nt	15P	nt	nt	nt	nt	nt	nt	nt
S28	25	12p	nt	14p	nt	nt	nt	nt	nt	nt	nt
S29	25	12h	nt	15P/h	nt	nt	nt	nt	nt	nt	nt
S30	20	0	nt	0	nt	nt	nt	nt	nt	nt	nt
S31	26	19h	nt	0	nt	0	0	nt	nt	nt	nt
S32	27.5	0	nt	12h	nt	nt	nt	nt	nt	nt	nt
S33	19	12P	nt	0	nt	nt	nt	nt	nt	nt	nt
S34	26.5	11p	nt	12P	nt	nt	nt	nt	nt	nt	nt
S35	26.5	15P	nt	13h	nt	nt	nt	nt	nt	nt	nt
S36	29	13p	nt	15p	nt	nt	nt	nt	nt	nt	nt
S37	30	11	nt	14p	nt	nt	nt	nt	nt	nt	nt
S38	28	0	nt	9.5	nt	0	0	nt	nt	nt	nt
S39	30	18	nt	16p	nt	nt	nt	nt	nt	nt	nt
S40	31	13	nt	15p/18P	nt	0	0	nt	nt	nt	nt
S41	30	11P	nt	0	nt	nt	nt	nt	nt	nt	nt
S42	27.5	10	nt	16p	nt	nt	nt	nt	nt	nt	nt
S43	27	13/18P	nt	18p	nt	nt	nt	nt	nt	nt	nt
S44	22	11	nt	12P	nt	nt	nt	nt	nt	nt	nt
S45	22	9.5	nt	16P	nt	nt	nt	nt	nt	nt	nt
S46	32	20P	nt	17p/P	nt	0	0	nt	nt	nt	nt
S47	29.5	20P	nt	13h	nt	nt	nt	nt	nt	nt	nt
S48	30	0	nt	12h	nt	nt	nt	nt	nt	nt	nt
S49	23	13P	nt	0	nt	nt	nt	nt	nt	nt	nt
S50	27	16P	nt	15P/h	nt	nt	nt	nt	nt	nt	nt

S51	0	0	nt	0	nt	nt	nt	nt	nt	nt	nt
S52	12p	0	nt	0	nt	nt	nt	nt	nt	nt	nt
S53	14	0	nt	0	nt	nt	nt	nt	nt	nt	nt
S54	0	0	0	nt	nt	nt	nt	nt	nt	nt	nt
S55	21	11.5	nt	15	nt	nt	nt	nt	nt	nt	nt
S56	29	11	nt	12/18p	nt	nt	nt	nt	nt	nt	nt
S57	23	0	nt	0	nt	nt	nt	nt	nt	nt	nt
S58	27	11	nt	0	nt	nt	nt	nt	nt	nt	nt
S59	17	9.5	nt	0	nt	nt	nt	nt	nt	nt	nt
cipro[e]	0 (8.0 μM)	26 (0.5 μM)	17 (2.0 μM)	30	35	45	40	nt	nt	nt	nt
TSA[f]	nt	nt	nt	nt	nt	nt	nt	nt	65%[g]	59%[h]	50%[i]

[a]A description of the agar diffusion antibacterial susceptibility assay is given in the main text along with a referenced literature protocol. Performed at UND.
[b]A description of the broth microdilution MIC_{90} determination assay is given in the main text along with a referenced literature protocol. Performed at UND.
[c]A description of this assay has been reported by our group previously.[5] Performed at UND.
[d]Compounds are shown in chronological order beginning with compounds featured in the main article text followed by compounds only shown in the supporting information.
[e]Ciprofloxacin; used as a broad spectrum antibacterial standard at a concentration of 5 μg/mL.
[f]Trichostatin A; used as a broad spectrum anticancer standard at concentrations indicated below.
[g]Percent inhibition at 25 nM TSA. [h]Percent inhibition at 200 nM TSA. [i]Percent inhibition at 150 nM TSA.
nt: indicates compound was not tested
h: indicates only a hint of growth inhibition detectable
P: indicates a very unclear growth inhibition zone
p: indicates unclear growth inhibition zone
s: indicates single colonies in the growth inhibition zone

III. Table of All Cell Lines From This Work

Table S3. Origins and markers of cell lines used in this work.

Cell Line	Marker	Origin/Reference
Gram-positive bacteria		
Micrococcus luteus ATCC 10240	wild type	American Type Culture Collection
Staphylococcus aureus SG511	wild type	Hans Knöll Institute, Jena, Germany
Enterococcus faecalis ATCC 49532	wild type	American Type Culture Collection
Mycobacterium vaccae IMET 10670	wild type	Hans Knöll Institute, Jena, Germany
Bacillus subtilis ATCC 6633	wild type	American Type Culture Collection
Staphylococcus aureus 134/94 (MRSA)	multidrug resistant	Witte et al. **1994**[6]
Enterococcus faecalis 1528 (VRE)	vancomycin resistant	Klare et al. **1995**[7]
Gram-negative bacteria		
Pseudomonas aeruginosa KW799/WT	wild Type	Zimmermann **1980**[8]
Pseudomonas aeruginosa KW799/61	antibiotic susceptible penetration mutant	Zimmermann **1980**[8]
Escherichia coli DC0	wild type	Richmond et al. **1976**[9]
Escherichia coli DC2	antibiotic susceptible penetration mutant	Richmond et al. **1976**[9]
Escherichia coli X580	β-Lactam Hypersensitive	Eli Lilly & Co.
Yeast		
Sporobolomyces salmonicolor 549	wild type	Hans Knöll Institute, Jena, Germany
Cancer cell lines		
MCF-7	breast cancer	Soule et al. **1973**[10]
PC-3	prostate cancer	Alimerah et al. **2006**[11]
HeLa	cervical cancer	Rahbari et al. **2009**[12]

IV. Experimental Procedures and Compound Characterization Data

General Procedure A: Nitroso ene reaction.

This general procedure followed a method described previously.[2,4] The nitroso compound (1.0 equiv) was slowly added to a solution of the olefin (2.0 equiv) in anhydrous CH_2Cl_2 (1.0 M with respect to olefin) at 0 ºC (ice bath temp). Once complete (TLC analysis; hexanes/EtOAc), the CH_2Cl_2 was evaporated under reduced pressure and the crude product was purified by silica gel column chromatography (hexanes/EtOAc) to give the desired nitroso ene adduct.

General Procedure B: Alkylation of BocNHOPMB (27).

Sodium hydride (60% in mineral oil; 1.2 equiv) solid was added to a solution of BocNHOPMB (**27**, 1.0 equiv) in anhydrous DMF (0.3–0.4 M with respect to **27**) at 0 ºC (ice bath temp). After stirring for 30 min, the alkyl halide (1.2 equiv) was added dropwise. The mixture was warmed to rt and stirred overnight under dry argon. The mixture was then cooled to 0 ºC (ice bath temp) and quenched by slow addition of 10% aqueous $NaHCO_3$. The DMF and H_2O were removed by high vacuum rotary evaporation (~1 mm Hg). The resulting material was partitioned between EtOAc and H_2O and the layers were separated. The H_2O was extracted at least once with EtOAc. All the EtOAc layers were combined, washed with brine, dried over anhydrous $MgSO_4$, filtered, and concentrated. The crude product was purified by silica gel column chromatography (hexanes/EtOAc) to give the desired *N*-alkylated product (**28**).

General Procedure C: *N*-Boc-deprotection of *N*-Boc-*N*-alkyl-*O*-(4-methoxybenzyl)hydroxylamines (28).

Anhydrous TFA was added to a solution of the *N*-Boc-*N*-alkyl-*O*-(4-methoxybenzyl)hydroxylamine (**28**, 1.0 equiv) in anhydrous CH_2Cl_2 (20%–50% TFA v/v; ~0.3 M with respect to **28**). After 15 min at rt, the TFA and CH_2Cl_2 were removed under vacuum and the resulting material was dissolved in $CHCl_3$ and washed with saturated aqueous $NaHCO_3$. The layers were separated and the $CHCl_3$ was dried over anhydrous $MgSO_4$, filtered, and concentrated. The crude product was purified by silica gel column chromatography (hexanes/EtOAc) to give the desired *N*-alkyl-*O*-(4-methoxybenzyl)hydroxylamine (**29**).

General Procedure D: Buchwald-Hartwig amination cross-coupling reactions.

This procedure followed the general method described previously by Buchwald and coworkers.[13] The *N*-alkyl-*O*-(4-methoxybenzyl)hydroxylamine (**29**, 1.2 equiv), 2-bromopyridine (1.0 equiv), $Pd_2(dba)_3$ (0.02 equiv), (±)-BINAP (0.04 equiv), and NaO^tBu (1.4 equiv) were dissolved in

anhydrous toluene (0.13 M with respect to the hydroxylamine), respectively, in an oven-dried, argon-flushed Schlenk tube. The mixture was heated to 70 ºC (oil bath temp) over the course of the reaction. Once complete (TLC; hexanes/EtOAc), the mixture was cooled to rt, diluted with Et_2O, and vacuum filtered through celite. The Et_2O was washed once with brine, dried over anhydrous $MgSO_4$, filtered, and concentrated. The crude product was purified by silica gel column chromatography (hexanes/EtOAc or hexanes/CH_2Cl_2) to give the desired *N*-alkyl-*O*-PMB-*N*-(pyridin-2-yl)hydroxylamine (**30**).

General Procedure E: Removal of *O*-PMB protecting group.

Anhydrous TFA was added slowly to a solution of the *N*-alkyl-*O*-PMB-*N*-(pyridin-2-yl)hydroxylamine (**30**, 1.0 equiv) and triethylsilane (2.0 equiv) in anhydrous CH_2Cl_2 (30% TFA v/v; ~0.03 M with respect to **30**) and stirred at rt under dry argon. Once complete (TLC analysis; hexanes/EtOAc), the mixture was diluted with CH_2Cl_2 and washed with saturated aqueous $NaHCO_3$. The layers were separated and the CH_2Cl_2 was dried over anhydrous $MgSO_4$, filtered, and concentrated. The crude product was purified either by silica gel column chromatography (hexanes/EtOAc) or precipitation/trituration with cold pentanes to give the desired *N*-alkyl-*N*-(pyridin-2-yl)hydroxylamine (**31**).

(±) *N*-(6-Methylpyridin-2-yl)-*N*-(3-methylbut-3-en-2-yl)hydroxylamine (9). This compound was prepared according to general procedure **A** using 2-methyl-2-butene (62.4 mg, 0.89 mmol) and 5-methyl-2-nitrosopyridine **8** (53.7 mg, 0.44 mmol) in 1 mL of CH_2Cl_2 for 20 min. Purification (0.5 x 6 in silica gel column; 17%–25% EtOAc in hexanes) provided the desired ene adduct (**9**) in 38% yield as a white solid (32.1 mg, 0.17 mmol). Mp 106–108 ºC; ^{1}H-NMR (600 MHz, DMSO-d_6) δ 8.64 (s, N–OH, 1 H), 7.47 (dd, *J* = 8.2, 7.0 Hz, 1 H), 6.84 (d, *J* = 8.2 Hz, 1 H), 6.57 (d, *J* = 6.5 Hz, 1 H), 5.09 (dd, *J* = 13.2, 6.5 Hz, 1 H), 4.87 (m, 1 H), 4.84 (m, 1 H), 2.32 (s, 3 H), 1.72 (s, 3 H), 1.15 (d, *J* = 6.5 Hz, 3 H); ^{13}C-NMR (150 MHz, DMSO-d_6) δ 162.6, 155.3, 146.0, 137.8, 113.4, 111.6, 105.5, 58.1, 24.2, 21.5, 13.5; HRMS-ESI (m/z): $[M+Na]^+$ calcd. for $C_{11}H_{16}N_2NaO$: 215.1155, found 215.1141; HPLC retention time 7.02 min.

(±) (*E*)-6-(*N*-Hydroxy-*N*-(pyridin-2-yl)amino)-3,7-dimethylocta-2,7-dien-1-ol (11a). This compound was prepared according to general procedure **A** using geraniol (137.0 mg, 0.89 mmol) and 2-nitrosopyridine **10** (47.6 mg, 0.44 mmol) in 1 mL of CH_2Cl_2 for 25 min. Purification (0.5 x 6 in silica gel column; 50% EtOAc in hexanes) provided the desired ene adduct (**11a**) as a white solid (58.9 mg, 0.22 mmol) and a mixture of **11a** and **11b** as a yellow solid (23.1 mg, 0.09

mmol) in 71% overall yield. Mp 108–110 ºC; ^{1}H-NMR (600 MHz, DMSO-d_6) δ 8.81 (s, N–OH, 1 H), 8.10 (ddd, *J* = 4.8, 1.9, 0.9 Hz, 1 H), 7.57 (ddd, *J* = 9.1, 7.0, 1.7 Hz, 1 H), 7.01 (dt, *J* = 8.3, 1.0, Hz, 1 H), 6.66 (ddd, *J* = 7.2, 4.8, 0.9 Hz, 1 H), 5.25–5.21 (m, 1 H), 4.94 (t, *J* = 6.9 Hz, 1 H), 4.86–4.84 (m, 1 H), 4.80 (t, *J* = 1.6 Hz, 1 H), 4.40 (t, *J* = 5.3 Hz, –OH, 1 H), 3.91 (t, *J* = 5.7 Hz, 2 H), 2.03–1.97 (m, 1 H), 1.91–1.74 (m, 3 H), 1.66 (s, 3 H), 1.56 (s, 3 H); ^{13}C-NMR (150 MHz, DMSO-d_6) δ 163.0, 146.9, 144.4, 137.4, 135.6, 125.1, 113.8, 112.6, 107.8, 62.6, 57.5, 27.2, 21.4, 16.1; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{15}H_{23}N_2O_2$: 263.1754, found 263.1768; IR (neat): 3188.5 (br), 3113.2, 3070.2, 3022.4, 1664.7, 1500.9, 1470.1, 1296.4, 1017.0, 981.4 cm^{-1}; HPLC retention time 6.18 min.

(±) *N*-(3-Methylbut-3-en-2-yl)-*N*-(pyridin-2-yl)hydroxylamine (12). This compound was prepared according to general procedure **A** using 2-methyl-2-butene (62.4 mg, 0.89 mmol) and 2-nitrosopyridine **10** (47.6 mg, 0.44 mmol) in 1 mL of CH_2Cl_2 for 15 min. Purification (0.5 x 6 in silica gel column; 17%–25% EtOAc in hexanes) provided the desired ene adduct (**12**) in 48% yield as a tan solid (37.6 mg, 0.21 mmol). Mp 67–70 ºC; ^{1}H-NMR (600 MHz, DMSO-d_6) δ 8.73 (s, N–OH, 1 H), 8.13 (ddd, *J* = 4.8, 1.9, 0.9 Hz, 1 H), 7.59 (ddd, *J* = 8.5, 7.3, 2.0 Hz, 1 H), 7.04 (dt, *J* = 8.5, 0.9 Hz, 1 H), 6.70 (ddd, *J* = 7.2, 4.8, 1.2 Hz, 1 H), 5.07 (q, *J* = 6.7 Hz, 1 H), 4.88–4.87 (m, 2 H), 1.73 (s, 3 H), 1.16 (d, *J* = 6.7 Hz, 3 H); ^{13}C-NMR (150 MHz, DMSO-d_6) δ 162.9, 147.0, 145.8, 137.5, 114.2, 111.6, 108.5, 58.1, 21.4, 13.4; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{10}H_{15}N_2O$: 179.1179, found 179.1200; HPLC retention time 5.86 min.

(±) *N*-(3-Methylbut-3-en-2-yl)-*N*-(quinolin-2-yl)hydroxylamine (14). This compound was prepared according to general procedure **A** using 2-methyl-2-butene (0.1 mL, 0.95 mmol) and 2-nitrosoquinoline **13** (50.0 mg, 0.32 mmol) in 2 mL of CH_2Cl_2 for 1 h. Purification (0.75 x 6 in silica gel column; 10%–30% EtOAc in hexanes) provided the desired ene adduct (**14**) in 53% yield as an orange solid (38.0 mg, 0.17 mmol). Mp 83–85 ºC; ^{1}H-NMR (600 MHz, DMSO-d_6) δ 9.12 (br s, N–OH, 1 H), 8.11 (d, *J* = 8.8 Hz, 1 H), 7.74 (dd, *J* = 7.9, 1.2 Hz, 1 H), 7.63–7.59 (m, 1 H), 7.57–7.53 (m, 1 H), 7.36 (d, *J* = 9.1 Hz, 1 H), 7.27 (ddd, *J* = 7.9, 6.8, 1.2 Hz, 1 H), 5.37 (q, *J* = 6.7 Hz, 1 H), 4.94 (s, 1 H), 4.90–4.88 (m, 1 H), 1.75 (s, 3 H), 1.27 (d, *J* = 6.7 Hz, 3 H); ^{13}C-NMR (150 MHz, DMSO-d_6) δ 160.8, 146.7, 145.6, 137.4, 129.4, 127.5, 126.3, 123.3, 122.4, 111.8, 110.7, 57.3, 21.4, 14.0; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{14}H_{17}N_2O$: 229.1335, found 229.1324; HPLC retention time 6.76 min.

(±) *N*-(5-Methylisoxazol-3-yl)-*N*-(3-methylbut-3-en-2-yl)hydroxylamine (16). This compound was prepared according to general procedure **A** using 2-methyl-2-butene (62.4 mg, 0.89 mmol) and 5-methyl-3-nitrosoisoxazole **15** (49.3 mg, 0.44 mmol) in 1 mL of CH_2Cl_2 for 10 min. Purification (0.5 x 6 in silica gel column; 17%–25% EtOAc in hexanes) provided the desired ene adduct (**16**) in 94% yield as a white solid (75.4 mg, 0.41 mmol). Mp 80–82 ºC; ^{1}H-NMR (500 MHz, DMSO-d_6) δ 8.95 (s, N–OH, 1 H), 5.94 (m, 1 H), 4.91–4.88 (m, 1 H), 4.88–4.85 (m, 1 H), 4.09 (q, *J* = 6.5 Hz, 1 H), 2.28 (s, 3H), 1.75 (s, 3 H), 1.19 (d, *J* = 6.6 Hz, 1 H); ^{13}C-NMR (125 MHz, DMSO-d_6) δ 169.6, 168.2, 144.5, 111.9, 94.6, 61.3, 20.7, 12.8, 11.7; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_9H_{15}N_2O_2$: 183.1128, found 183.1131; HPLC retention time 5.31 min.

(±) *N*-(3-Methylbut-3-en-2-yl)-*N*-(4-methylpyridin-2-yl)-hydroxylamine (18b). This compound was prepared according to general procedure **A** using 2-methyl-2-butene (0.42 mL, 3.97 mmol) and 4-methyl-2-nitrosopyridine **17b** (244.0 mg, 2.00 mmol) in 4 mL of CH_2Cl_2 for 30 min. Purification (1.25 x 6 in silica gel column; 10%–20% EtOAc in hexanes) provided the desired ene adduct (**18b**) in 47% yield as a light brown solid (180.0 mg, 0.94 mmol). Mp 97.5–98.5 ºC; ^{1}H-NMR (600 MHz, DMSO-d_6) δ 8.69 (br s, N–OH, 1 H), 7.99 (d, *J* = 5.0 Hz, 1 H), 6.88 (dt, *J* = 1.5, 0.8 Hz, 1 H), 6.56–6.54 (m, 1 H), 5.05 (q, *J* = 6.7 Hz, 1 H), 4.87–4.86 (m, 1 H), 4.86–4.84 (m, 1 H), 2.24 (s, 3 H), 1.74–1.71 (m, 3 H), 1.14 (d, *J* = 6.7 Hz, 3 H); ^{13}C-NMR (150 MHz, DMSO-d_6) δ 163.1, 147.9, 146.9, 146.0, 115.6, 111.6, 108.8, 58.3, 21.5, 20.9, 13.4; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{11}H_{17}N_2O$: 193.1335, found 193.1326; HPLC retention time 6.35 min.

(±) *N*-(3-Methylbut-3-en-2-yl)-*N*-(3-methylpyridin-2-yl)-hydroxylamine (18c). This compound was prepared according to general procedure **A** using 2-methyl-2-butene (0.42 mL, 3.97 mmol) and 3-methyl-2-nitrosopyridine **17c** (244.0 mg, 2.00 mmol) in 4 mL of CH_2Cl_2 for 9 h. Purification (1.25 x 7 in silica gel column; 10%–30% EtOAc in hexanes) provided the desired ene adduct (**18c**) in 8% yield as a clear, colorless oil (30.0 mg, 0.16 mmol). ^{1}H-NMR (600 MHz, DMSO-d_6) δ 8.34 (br s, N–OH, 1 H), 8..09 (dd, *J* = 4.7, 1.5 Hz, 1 H), 7.48 (ddd, *J* = 7.3, 1.9, 0.7 Hz, 1 H), 6.94 (dd, *J* = 7.2, 4.8 Hz, 1 H), 4.89–4.87 (m, 1 H), 4.78–4.76 (m, 1 H), 4.43 (q, *J* = 6.5 Hz, 1 H), 2.31 (s, 3 H), 1.78 (s, 3 H), 1.16 (d, *J* = 6.5 Hz, 3 H); ^{13}C-NMR (150 MHz, DMSO-d_6) δ 160.4, 147.1, 144.1, 139.3, 126.1, 118.9, 111.1, 60.2, 20.5, 18.8, 15.0; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{11}H_{17}N_2O$: 193.1335, found 193.1335; HPLC retention time 6.75 min.

(±) *N*-(5-Chloropyridin-2-yl)-*N*-(3-methylbut-3-en-2-yl)hydroxylamine (18d). This compound was prepared according to general procedure **A** using 2-methyl-2-butene (0.22 mL, 2.08 mmol) and 5-chloro-2-nitrosopyridine **17d** (141.0 mg, 0.99 mmol) in 2 mL of CH_2Cl_2 for 30 min. Purification (0.75 x 6 in silica gel column; 5%–10% EtOAc in hexanes) provided the desired ene adduct (**18d**) in 59% yield as a tan solid (150.0 mg, 0.58 mmol). Mp 64.5–66 ºC; ^{1}H-NMR (600 MHz, DMSO-d_6) δ 8.97 (s, N–OH, 1 H), 8.15 (dd, *J* = 2.6, 0.6 Hz, 1 H), 7.67 (dd, *J* = 8.8, 2.6 Hz, 1 H), 7.04 (dd, *J* = 8.9, 0.7 Hz, 1 H), 5.01 (q, *J* = 6.7 Hz, 1 H), 4.88–4.85 (m, 2 H), 1.71 (s, 3 H), 1.18 (d, *J* = 6.7 Hz, 3 H); ^{13}C-NMR (150 MHz, DMSO-d_6) δ 161.4, 145.4, 145.2, 137.3, 120.0, 111.9, 109.8, 58.3, 21.3, 13.7; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{10}H_{14}ClN_2O$: 213.0789, found 213.0806; HPLC retention time 7.99 min.

(±) *N*-(5-Bromopyridin-2-yl)-*N*-(3-methylbut-3-en-2-yl)hydroxylamine (18e). This compound was prepared according to general procedure **A** using 2-methyl-2-butene (62.4 mg, 0.89 mmol) and 5-bromo-2-nitrosopyridine **17e** (82.3 mg, 0.44 mmol) in 1 mL of CH_2Cl_2 for 10 min. Purification (0.5 x 6 in silica gel column; 17%–25% EtOAc in hexanes) provided the desired ene adduct (**18e)** in 64% yield as a faint yellow solid (72.4 mg, 0.28 mmol). Mp 65–67 ºC; ^{1}H-NMR (600 MHz, DMSO-d_6) δ 8.98 (s, N–OH, 1 H), 8.20 (dd, *J* = 2.5, 0.7 Hz, 1 H), 7.76 (dd, *J* = 8.8, 2.6 Hz, 1 H), 6.99 (dd, *J* = 8.9, 0.7 Hz, 1 H), 5.01 (q, *J* = 6.7 Hz, 1 H), 4.87–4.85 (m, 2 H), 1.70 (s, 3 H), 1.18 (d, *J* = 6.7 Hz, 3 H); ^{13}C-NMR (150 MHz, DMSO-d_6) δ 161.5, 147.4, 145.3, 139.9, 111.9, 110.4, 108.0, 58.2, 21.3, 13.7; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{10}H_{14}BrN_2O$: 257.0284, found 257.0290; HPLC retention time 8.21 min.

(±) *N*-(5-Iodopyridin-2-yl)-*N*-(3-methylbut-3-en-2-yl)hydroxylamine (18f). This compound was prepared according to general procedure **A** using 2-methyl-2-butene (0.10 mL, 0.95 mmol) and 5-iodo-2-nitrosopyridine **17f** (68.0 mg, 0.29 mmol) in 2 mL of CH_2Cl_2 for 1 h. Purification (0.75 x 8 in silica gel column; 1%–15% EtOAc in hexanes) provided the desired ene adduct (**18f**) in 68% yield as a grey solid (60.0 mg, 0.20 mmol). Mp 88.5–90 ºC; ^{1}H-NMR (600 MHz, DMSO-d_6) δ 8.95 (s, N–OH, 1 H), 8.29 (dd, *J* = 2.3, 0.6 Hz, 1 H), 7.86 (dd, *J* = 8.8, 2.3 Hz, 1 H), 6.91 (dd, *J* = 8.8, 0.6 Hz, 1 H), 5.00 (q, *J* = 6.7 Hz, 1 H), 4.87–4.85 (m, 2 H), 1.70 (s, 3 H), 1.17 (d, *J* = 6.7 Hz, 3 H); ^{13}C-NMR (150 MHz, DMSO-d_6) δ 161.7, 152.3, 145.4, 145.1, 111.9, 111.1, 79.3, 58.1, 21.3, 13.7; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{10}H_{14}IN_2O$: 305.0145, found 305.0145; HPLC retention time 8.56 min.

(±) *N*-(3,5-Dichloropyridin-2-yl)-*N*-(3-methylbut-3-en-2-yl)hydroxylamine (18g). This compound was prepared according to general procedure **A** using 2-methyl-2-butene (0.22 mL, 2.08 mmol) and 3,5-dichloro-2-nitrosopyridine **17g** (176.0 mg, 0.99 mmol) in 2 mL of CH_2Cl_2 for 1 h. Purification (0.75 x 6 in silica gel column; 5%–10% EtOAc in hexanes) provided the desired ene adduct (**18g**) in 67% yield as a clear, colorless oil (165.0 mg, 0.67 mmol). ^{1}H-NMR (600 MHz, DMSO-d_6) δ 8.82 (s, N–OH, 1 H), 8.29 (d, J = 2.3 Hz, 1 H), 8.05 (d, J = 2.3 Hz, 1 H), 4.87–4.85 (m, 1 H), 4.80–4.78 (m, 1 H), 4.41 (q, J = 6.6 Hz, 1 H), 1.77 (s, 3 H), 1.21 (d, J = 6.5 Hz, 3 H); ^{13}C-NMR (150 MHz, DMSO-d_6) δ 157.0, 146.1, 143.6, 138.3, 124.7, 123.0, 111.7, 60.6, 20.6, 14.9; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{10}H_{13}Cl_2N_2O$: 247.0399, found 247.0427; HPLC retention time 8.63 min.

(±) *N*-(5-Bromo-6-methylpyridin-2-yl)-*N*-(3-methylbut-3-en-2-yl)hydroxylamine (18h). This compound was prepared according to general procedure **A** using 2-methyl-2-butene (0.21 mL, 1.99 mmol) and 5-bromo-6-methyl-2-nitrosopyridine **17h** (201.0 mg, 1.00 mmol) in 2 mL of CH_2Cl_2 for 30 min. Purification (1 x 6 in silica gel column; 5%–20% EtOAc in hexanes) provided the desired ene adduct (**18h**) in 62% yield as a faint orange solid (169.0 mg, 0.62 mmol). Mp 65–67 ºC; ^{1}H-NMR (500 MHz, DMSO-d_6) δ 8.90 (s, N–OH, 1 H), 7.71 (d, J = 8.8 Hz, 1 H), 6.81 (d, J = 8.8 Hz, 1 H), 5.04 (q, J = 6.5 Hz, 1 H), 4.88–4.86 (m, 1 H), 4.86–4.83 (m, 1 H), 2.42 (s, 3 H), 1.70 (s, 3 H), 1.17 (d, J = 6.8 Hz, 3 H); ^{13}C-NMR (125 MHz, DMSO-d_6) δ 161.3, 153.2, 145.5, 141.0, 111.9, 108.3, 108.1, 58.2, 24.6, 21.4, 13.8; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{11}H_{16}BrN_2O$: 271.0441; found, 271.0432; HPLC retention time 9.27 min.

(±) *N*-(3-Chloro-5-(trifluoromethyl)pyridin-2-yl)-*N*-(3-methylbut-3-en-2-yl)hydroxylamine (18i). This compound was prepared according to general procedure **A** using 2-methyl-2-butene (0.11 mL, 1.00 mmol) and 3-chloro-5-(trifluoromethyl)-2-nitrosopyridine **17i** (105.0 mg, 0.50 mmol) in 2 mL of CH_2Cl_2 for 45 min. Purification (0.75 x 8 in silica gel column; 5%–10% EtOAc in hexanes) provided the desired ene adduct (**18i**) in 75% yield as a faint purple solid (105.6 mg, 0.38 mmol). Mp 39–40 ºC; ^{1}H-NMR (600 MHz, DMSO-d_6) δ 9.21 (s, 1 H), 8.52–8.50 (m, 1 H), 8.13–8.10 (m, 1 H), 4.92–4.90 (m, 1 H), 4.88–4.86 (m, 1 H), 4.84 (q, J = 6.5 Hz, 1 H), 1.76 (s, 3 H), 1.27 (d, J = 6.8 Hz, 3 H); ^{13}C-NMR (150 MHz, DMSO-d_6) δ 159.6, 145.2, 142.4 (q, J_{C-F} = 4.3 Hz), 136.6 (q, J_{C-F} = 3.2 Hz), 123.4 (q, J_{C-F} = 271.5 Hz), 118.8, 118.3 (q, J_{C-F} = 33.1 Hz), 112.1, 59.2, 21.1, 14.2; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{11}H_{13}ClF_3N_2O$: 281.0663, found 281.0677; HPLC retention time 9.16 min.

***N*-(2,3-Dimethylbut-3-en-2-yl)-*N*-(pyridin-2-yl)hydroxylamine (19a).** This compound was prepared according to general procedure **A** using 2,3-dimethyl-2-butene (0.11 mL, 1.0 mmol) and 2-nitrosopyridine **10** (50.0 mg, 0.46 mmol) in 2 mL of CH_2Cl_2 for 30 min. Purification (0.5 x 6 in silica gel column; 5%–10% EtOAc in hexanes) provided the desired ene adduct (**19a**) in 71% yield as a brown oil (63.2 mg, 0.33 mmol). ^{1}H-NMR (600 MHz, DMSO-d_6) δ 8.94 (s, N–OH, 1 H), 8.09–8.06 (m, 1 H), 7.57 (ddd, *J* = 8.5, 7.3, 2.1 Hz, 1 H), 7.12 (dt, *J* = 8.2, 0.9 Hz, 1 H), 6.74 (ddd, *J* = 7.2, 4.8, 1.2 Hz, 1 H), 4.74–4.73 (m, 1 H), 4.63–4.61 (m, 1 H), 1.79 (d, *J* = 0.6 Hz, 3 H), 1.35 (s, 6 H); ^{13}C-NMR (150 MHz, DMSO-d_6) δ 163.1, 152.3, 146.3, 136.9, 115.3, 111.6, 107.4, 65.8, 24.7, 20.0; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{11}H_{17}N_2O$: 193.1335, found 193.1340; HPLC retention time 6.81 min.

***N*-(2-Phenylallyl)-*N*-(pyridin-2-yl)hydroxylamine (19b).** This compound was prepared according to general procedure **A** using 1-(prop-1-en-2-yl)benzene (109.0 mg, 0.92 mmol) and 2-nitrosopyridine **10** (50.0 mg, 0.46 mmol) in 2 mL of CH_2Cl_2 for 3 h. Purification (0.5 x 6 in silica gel column; 5%–10% EtOAc in hexanes) provided the desired ene adduct (**19b**) in 6% yield as a yellow oil (6.3 mg, 0.03 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.24 (d, *J* = 4.7 Hz, 1 H), 7.60–7.54 (m, 3 H), 7.34 (t, *J* = 7.5 Hz, 2 H), 7.29 (d, *J* = 7.3 Hz, 1 H), 7.09 (d, *J* = 8.5 Hz, 1 H), 6.82–6.78 (m, 1 H), 5.59 (s, 1 H), 5.40 (s, 1 H), 4.75 (s, 2 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 161.6, 146.5, 143.3, 138.9, 137.9, 128.3, 127.8, 126.3, 115.8, 115.5, 109.3, 58.6; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{14}H_{15}N_2O$: 227.1179, found 227.1186; HPLC retention time, 7.39 min.

5-(*N*-Hydroxy-*N*-(pyridin-2-yl)amino)-6-methylhept-6-en-2-one (19c). This compound was prepared according to general procedure **A** using 6-methylhept-5-en-2-one (0.30 mL, 2.00 mmol) and 2-nitrosopyridine **10** (108.1 mg, 1.00 mmol) in 2 mL of CH_2Cl_2 for 10 min. Purification (1 x 5 in silica gel column; 33% EtOAc in hexanes) provided the desired ene adduct (**19c**) in 94% yield as a light brown, crystalline solid (220.0 mg, 0.94 mmol). Mp 66–70 ºC; ^{1}H-NMR (600 MHz, DMSO-d_6) δ 8.82 (s, N-OH, 1 H), 8.10–8.07 (m, 1 H), 7.61–7.54 (m, 1 H), 7.01 (d, *J* = 8.5 Hz, 1 H), 6.68–6.64 (m, 1 H), 4.94 (t, *J* = 7.5 Hz, 1 H), 4.85–4.78 (m, 2 H), 2.48–2.38 (m, 2 H), 2.00 (s, 3 H), 1.94–1.87 (m, 2 H), 1.66–1.60 (m, 3 H); ^{13}C-NMR (150 MHz, DMSO-d_6) δ 208.2, 163.0, 147.0, 144.5, 137.6, 113.9, 112.6, 107.6, 61.8, 40.0, 29.8, 23.0, 21.4; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{13}H_{19}N_2O_2$: 235.1441, found 235.1444; IR (neat): 3091.7 (br), 3052.8, 1713.6, 1593.3, 1430.0, 1163.5 cm^{-1}; HPLC retention time 5.88 min.

***N*-Boc-*O*-(4-Methoxybenzyl)-*N*-methylhydroxylamine (28a).** This compound was prepared according to general procedure **B** using BocNHOPBM (2.0 g, 7.90 mmol), sodium hydride (60% in mineral oil; 415.0 mg, 10.38 mmol), and methyl iodide (0.59 mL, 9.46 mmol) in 20 mL of DMF for 26 h. Purification (1.5 x 6 in silica gel column; 100% hexanes–10% EtOAc in hexanes) provided the desired product (**28a**) in 91% yield as a clear, colorless liquid (1.91 g, 7.15 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 7.35–7.32 (m, 2 H), 6.90–6.87 (m, 2 H), 4.77 (s, 2 H), 3.81 (s, 3 H), 3.03 (s, 3 H), 1.50 (s, 9 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 159.8, 156.9, 131.0, 127.8, 113.7, 81.1, 76.0, 55.2, 36.7, 28.2; HRMS-ESI (m/z): $[M+Na]^+$ calcd. for $C_{14}H_{21}NNaO_4$: 290.1363, found 290.1361.

***N*-Boc-*O*-(4-Methoxybenzyl)-*N*-(prop-1-yl)hydroxylamine (28b).** This compound was prepared according to general procedure **B** using BocNHOPBM (446.2 mg, 1.76 mmol), sodium hydride (60% in mineral oil; 102.0 mg, 2.55 mmol), and 1-bromopropane (0.19 mL, 2.09 mmol) in 6 mL of DMF for 5 h. Purification (1 x 6 in silica gel column; 10% EtOAc in hexanes) provided the desired product (**28b**) in 98% yield as a clear, colorless liquid (512.0 mg, 1.73 mmol). ^{1}H-NMR (300 MHz, $CDCl_3$) δ 7.33 (d, J = 8.6 Hz, 2 H), 6.88 (d, J = 8.8 Hz, 2 H), 4.76 (s, 2 H), 3.80 (s, 3 H), 3.41–3.33 (m, 2 H), 1.70–1.56 (m, 2 H), 1.51 (s, 9 H), 0.89 (t, J = 7.5 Hz, 3 H); ^{13}C-NMR (75 MHz, $CDCl_3$) δ 159.7, 156.5, 130.9, 127.8, 113.7, 80.9, 76.3, 55.2, 51.1, 28.2, 20.3, 11.2; HRMS-ESI (m/z): $[M+Na]^+$ calcd. for $C_{16}H_{25}NNaO_4$: 318.1676, found 318.1687.

***N*-Boc-*N*-(hex-1-yl)-*O*-(4-Methoxybenzyl)hydroxylamine (28c).** This compound was prepared according to general procedure **B** using BocNHOPBM (550.0 mg, 2.17 mmol), sodium hydride (60% in mineral oil; 140.0 mg, 3.50 mmol), and 1-bromohexane (0.37 mL, 2.64 mmol) in 5 mL of DMF for 14 h. Purification (1 x 6 in silica gel column; 5%–20% EtOAc in hexanes) provided the desired product (**28c**) in 97% yield as a clear, colorless liquid (713.0 mg, 2.11 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 7.35–7.31 (m, 2 H), 6.90–6.86 (m, 2 H), 4.76 (s, 2 H), 3.80 (s, 3 H), 3.40–3.37 (m, 2 H), 1.62–1.55 (m, 2 H), 1.51 (s, 9 H), 1.33–1.24 (m, 6 H), 0.90–0.86 (m, 3 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 159.7, 156.5, 130.9, 127.8, 113.7, 80.9, 76.3, 55.2, 49.5, 31.4, 28.3, 26.9, 26.3, 22.5, 14.0; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{19}H_{32}NO_4$: 338.2326, found 338.2325.

***N*-Boc-*O*-(4-Methoxybenzyl)-*N*-(pheneth-2-yl)hydroxylamine (28e).** This compound was prepared according to general procedure **B** using BocNHOPBM (513.0 mg, 2.03 mmol), sodium

hydride (60% in mineral oil; 120.0 mg, 3.00 mmol), and (2-bromoethyl)benzene (0.33 mL, 2.42 mmol) in 5 mL of DMF for 14 h. Purification (1 x 6 in silica gel column; 5%–20% EtOAc in hexanes) provided the desired product (**28e**) in 98% yield as a clear, colorless liquid (712.0 mg, 1.99 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 7.38–7.35 (m, 2 H), 7.33–7.29 (m, 2 H), 7.25–7.21 (m, 3 H), 6.94–6.91 (m, 2 H), 4.79 (s, 2 H), 3.83 (s, 3 H), 3.66–3.62 (m, 2 H), 2.93–2.89 (m, 2 H), 1.49 (s, 9 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 159.7, 156.2, 138.9, 130.9, 128.8, 128.3, 127.8, 126.1, 113.7, 81.0, 76.4, 55.2, 51.2, 33.3, 28.2; HRMS-ESI (m/z): $[M+Na]^+$ calcd. for $C_{21}H_{27}NNaO_4$: 380.1832, found 380.1833.

***N*-Allyl-*N*-Boc-*O*-(4-methoxybenzyl)hydroxylamine (28f).** This compound was prepared according to general procedure **B** using BocNHOPBM (810.0 mg, 3.20 mmol), sodium hydride (60% in mineral oil; 180.0 mg, 4.50 mmol), and allyl bromide (0.33 mL, 3.90 mmol) in 8 mL of DMF for 10 h. Purification (1 x 6 in silica gel column; 10%–20% EtOAc in hexanes) provided the desired product (**28f**) in 87% yield as a clear, colorless liquid (815.0 mg, 2.78 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 7.34–7.31 (m, 2 H), 6.90–6.87 (m, 2 H), 5.91–5.83 (m, 1 H), 5.23 (dq, *J* = 17.3, 1.5 Hz, 1 H), 5.20–5.17 (m, 1 H), 4.78 (s, 2 H), 3.99 (dt, *J* = 6.2, 1.3 Hz, 2 H), 3.81 (s, 3 H), 1.51 (s, 9 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 159.8, 156.6, 132.8, 131.0, 127.8, 118.0, 113.7, 81.3, 76.7, 55.2, 52.8, 28.3; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{16}H_{24}NO_4$: 294.1700, found 294.1705.

***N*-Boc-*O*-(4-Methoxybenzyl)-*N*-(3-phenoxybenzyl)hydroxylamine (28g).** This compound was prepared according general procedure **B** using BocNHOPBM (600.0 mg, 2.37 mmol), sodium hydride (60% in mineral oil; 125.0 mg, 3.13 mmol), and 3-phenoxybenzyl bromide (515.0 mg, 1.96 mmol) in 8 mL of DMF for 24 h. Purification (1.25 x 6 in silica gel column; 10% EtOAc in hexanes) provided the desired product (**28g**) in 50% yield as a clear, colorless liquid (518.1 mg, 1.19 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 7.35–7.31 (m, 2 H), 7.30 (t, *J* = 7.9 Hz, 1 H), 7.22–7.19 (m, 2 H), 7.11 (ddd, *J* = 7.5, 1.0, 0.9 Hz, 1 H), 7.10–7.07 (m, 1 H), 7.03–6.99 (m, 3 H), 6.95–6.93 (m, 1 H), 6.87–6.83 (m, 2 H), 4.66 (s, 2 H), 4.50 (s, 2 H), 3.81 (s, 3 H), 1.50 (s, 9 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 159.8, 157.3, 157.1, 156.5, 139.0, 131.0, 129.7, 129.6, 127.7, 123.4, 123.2, 119.0, 118.9, 117.9, 113.7, 81.6, 76.9, 55.2, 53.6, 28.3; HRMS-ESI (m/z): $[M+Na]^+$ calcd. for $C_{26}H_{29}NNaO_5$: 458.1938, found 458.1942.

***N*-Boc-*O*-(4-Methoxybenzyl)-*N*-(4-(trifluoromethyl)benzyl)hydroxylamine (28h).** This compound was prepared according to general procedure **B** using BocNHOPBM (798.0 mg, 3.15

mmol), sodium hydride (60% in mineral oil; 180.0 mg, 4.50 mmol), and 4-(trifluormethyl)benzyl bromide (1.05 g, 4.39 mmol) in 10 mL of DMF for 22 h. Purification (1.5 x 5 in silica gel column; 5%–20% EtOAc in hexanes) provided the desired product (**28h**) in 98% yield as a clear, colorless liquid (1.26 g, 3.07 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 7.58 (d, J = 7.9 Hz, 2 H), 7.42 (d, J = 7.9 Hz, 2 H), 7.22–7.18 (m, 2 H), 6.87–6.84 (m, 2 H), 4.68 (s, 2 H), 4.57 (s, 2 H), 3.81 (s, 3 H), 1.51 (s, 9 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 159.9, 156.6, 141.0, 131.0, 129.8 (q, J_{C-F} = 32.5 Hz) , 128.7, 127.5, 125.3 (q, J_{C-F} = 3.9 Hz), 123.2, 113.8, 81.9, 76.9, 55.2, 53.5, 28.3; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{21}H_{25}F_3NO_4$: 412.1730, found 412.1738.

***N*-Boc-*O*-(4-Methoxybenzyl)-*N*-(4-(trifluoromethoxy)benzyl)hydroxylamine (28i).** This compound was prepared according to general procedure **B** using BocNHOPBM (816.0 mg, 3.22 mmol), sodium hydride (60% in mineral oil; 195.0 mg, 4.87 mmol), and 4-(trifluoromethoxy)benzyl bromide (0.72 mL, 4.50 mmol) in 10 mL of DMF for 22 h. Purification (1.5 x 5 in silica gel column; 5%–30% EtOAc in hexanes) provided the desired product (**28i**) in 86% yield as a clear, colorless liquid (1.18 g, 2.77 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 7.36–7.33 (m, 2 H), 7.21–7.18 (m, 2 H), 7.17 (dd, J = 8.8, 0.9 Hz, 2 H), 6.87–6.84 (m, 2 H), 4.66 (s, 2 H), 4.51 (s, 2 H), 3.81 (s, 3 H), 1.51 (s, 9 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 159.8, 156.6, 148.57 (q, J_{C-F} = 1.7 Hz) 135.7, 131.0, 130.1, 127.5, 120.9, 120.4 (q, J_{C-F} = 256.9 Hz), 113.8, 81.8, 76.9, 55.2, 53.1, 28.3; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{21}H_{25}F_3NO_5$: 428.1679, found 428.1676.

***O*-(4-Methoxybenzyl)-*N*-methylhydroxylamine (29a).** This compound was prepared according to general procedure **C** using compound **28a** (754.0 mg, 2.82 mmol) in 8 mL of TFA:CH_2Cl_2 (1:4) for 15 min. The desired compound (**29a**) was isolated in 99% crude yield as a clear, colorless liquid (465.0 mg, 2.78 mmol) and was used directly in the next reaction without purification or characterization.

***O*-(4-Methoxybenzyl)-*N*-(prop-1-yl)hydroxylamine (29b).** This compound was prepared according to general procedure **C** using compound **28b** (702 mg, 2.38 mmol) in 8 mL of TFA:CH_2Cl_2 (1:1) for 15 min. The desired compound (**29b**) was isolated in 99% crude yield as a clear, colorless liquid (463.0 mg, 2.37 mmol) and was used directly in the next reaction without purification or characterization.

***N*-(Hex-1-yl)-*O*-(4-methoxybenzyl)hydroxylamine (29c).** This compound was prepared according to general procedure **C** using compound **28c** (1.00 g, 2.96 mmol) in 5 mL of

TFA:CH_2Cl_2 (1:1) for 15 min. Purification (1 x 6 in silica gel column; 10%–25% EtOAc in hexanes) provided the desired product (**29c**) in 77% yield as a clear, colorless liquid (541.3 mg, 2.28 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 7.32–7.29 (m, 2 H), 6.91–6.87 (m, 2 H), 4.66 (s, 2 H), 3.81 (s, 3 H), 2.95–2.91 (m, 2 H), 1.54–1.48 (m, 2 H), 1.35–1.25 (m, 6 H), 0.91–0.87 (m, 3 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 159.3, 130.0, 129.9, 113.7, 75.8, 55.2, 52.1, 31.7, 27.2, 26.9, 22.6, 14.0; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{14}H_{24}NO_2$: 238.1802, found 238.1802.

***O*-(4-Methoxybenzyl)-*N*-(pheneth-2-yl)hydroxylamine (29e).** This compound was prepared according to general procedure **C** using compound **28e** (639.8 mg, 1.79 mmol) in 10 mL of TFA:CH_2Cl_2 (3:7) for 15 min. Purification (0.75 x 5 in silica gel column; 5%–25% EtOAc in hexanes) provided the desired product (**29e**) in 73% yield as a clear, colorless liquid (336.1 mg, 1.31 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 7.33–7.28 (m, 4 H), 7.24–7.20 (m, 3 H), 6.92–6.88 (m, 2 H), 5.54 (br s, NH, 1 H), 4.67 (s, 2 H), 3.82 (s, 3 H), 3.19 (t, *J* = 7.2 Hz, 2 H), 2.86 (t, *J* = 7.2 Hz, 2 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 159.3, 139.5, 130.0, 129.9, 128.8, 128.5, 126.2, 113.7, 75.7, 55.3, 53.2, 33.7; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{16}H_{20}NO_2$: 258.1489, found 258.1489.

***N*-Allyl-*O*-(4-methoxybenzyl)hydroxylamine (29f).** This compound was prepared according to general procedure **C** using compound **28f** (528.0 mg, 1.80 mmol) in 15 mL of TFA:CH_2Cl_2 (1:5) for 15 min. Purification (0.75 x 6 in silica gel column; 10%–20% EtOAc in hexanes) provided the desired product (**29f**) in 58% yield as a clear, colorless liquid (200.0 mg, 1.04 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 7.32–7.28 (m, 2 H), 6.91–6.87 (m, 2 H), 5.96–5.88 (m, 1 H), 5.50 (br s, NH, 1 H), 5.24 (dq, *J* = 17.2, 1.6 Hz, 1 H), 5.19–5.15 (m,1 H), 4.66 (s, 2 H), 3.82 (s, 3 H), 3.54 (ddd, *J* = 6.3, 1.5, 1.3 Hz, 2 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 159.3, 134.3, 130.0, 129.9, 117.8, 113.7, 75.8, 55.3, 55.0; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{11}H_{16}NO_2$: 194.1176, found 194.1177.

***O*-(4-Methoxybenzyl)-*N*-(3-phenoxybenzyl)hydroxylamine (29g).** This compound was prepared according to general procedure **C** using compound **28g** (196.0 mg, 0.45 mmol) in 8 mL of TFA:CH_2Cl_2 (1:7) for 15 min. Purification (1 x 6 in silica gel column; 10%–20% EtOAc in hexanes) provided the desired product (**29g**) in 70% yield as a clear, colorless liquid (105.0 mg, 0.31 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 7.37–7.33 (m, 2 H), 7.30 (t, *J* = 7.9 Hz, 1 H), 7.25–7.22 (m, 2 H), 7.14–7.10 (m, 1 H), 7.10–7.08 (m, 1 H), 7.04–7.03 (m, 2 H), 7.03–7.01 (m, 1 H), 6.94 (ddd, *J* = 8.1, 2.6, 1.0 Hz, 1 H), 6.88–6.85 (m, 2 H), 5.69 (br s, NH, 1 H), 4.58 (s, 2 H), 4.01

(s, 2 H), 3.81 (s, 3 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 159.3, 157.3, 157.1, 139.8, 130.1, 129.8, 129.7, 129.6, 123.7, 123.2, 119.2, 118.9, 117.8, 113.7, 75.9, 56.1, 55.2; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{21}H_{22}NO_3$: 336.1594, found 336.1599.

***O*-(4-Methoxybenzyl)-*N*-(4-(trifluoromethyl)benzyl)hydroxylamine (29h).** This compound was prepared according to general procedure **C** using compound **28h** (672.0 mg, 1.63 mmol) in 6 mL of TFA:CH_2Cl_2 (1:5) for 15 min. Purification (1.25 x 5 in silica gel column; 10%–20% EtOAc in hexanes) provided the desired product (**29h**) in 62% yield as an off-white solid (317.0 mg, 1.02 mmol). Mp 34.5–36.5 ºC; ^{1}H-NMR (600 MHz, $CDCl_3$) δ 7.59 (d, *J* = 7.9 Hz, 2 H), 7.46 (d, *J* = 7.9 Hz, 2 H), 7.23–7.20 (m, 2 H), 6.88–6.85 (m, 2 H), 5.75 (br s, NH, 1 H), 4.57 (s, 2 H), 4.08 (s, 2 H), 3.81 (s, 3 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 159.4, 142.0, 130.1, 129.6, 129.1, 125.2 (q, J_{C-F} = 3.9 Hz), 113.7, 76.0, 55.9, 55.2; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{16}H_{17}F_3NO_2$: 312.1206, found 312.1190.

***O*-(4-Methoxybenzyl)-*N*-(4-(trifluoromethoxy)benzyl)hydroxylamine (29i).** This compound was prepared according to general procedure **C** using compound **28i** (607.0 mg, 1.42 mmol) in 6 mL of TFA:CH_2Cl_2 (1:5) for 15 min. Purification (1.25 x 6 in silica gel column; 10%–20% EtOAc in hexanes) provided the desired product (**29i**) in 71% yield as an off-white solid (331.0 mg, 1.01 mmol). Mp 28–30 ºC; ^{1}H-NMR (600 MHz, $CDCl_3$) δ 7.39–7.36 (m, 2 H), 7.23–7.20 (m, 2 H), 7.20–7.17 (m, 2 H), 6.88–6.85 (m, 2 H), 5.70 (br s, NH, 1 H), 4.57 (s, 2 H), 4.03 (s, 2 H), 3.81 (s, 3 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 159.4, 136.6, 130.2, 130.1, 129.7, 120.8 (q, J_{C-F} = 1.12 Hz), 113.7, 76.0, 55.6, 55.2; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{16}H_{17}F_3NO_3$: 328.1155, found 328.1142.

***O*-(4-Methoxybenzyl)-*N*-methyl-*N*-(pyridin-2-yl)hydroxylamine (30a)**. This compound was prepared according to general procedure **D** using crude compound **29a** (200.6 mg, 1.20 mmol), 2-bromopyridine (0.10 mL, 1.00 mmol), $Pd_2(dba)_3$ (18.0 mg, 0.02 mmol), (±) BINAP (25.0 mg, 0.04 mmol), and NaO^{t}Bu (134.0 mg, 1.40 mmol) in 9 mL of toluene for 96 h. Purification (1.25 x 6 in silica gel column; 10%–20% EtOAc in hexanes) provided the desired product (**30a**) in 77% yield as a clear, colorless liquid (187.7 mg, 0.77 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.25 (ddd, *J* = 4.8, 1.9, 0.9 Hz, 1 H), 7.55 (ddd, *J* = 8.6, 7.0, 1.8 Hz, 1 H), 7.41–7.38 (m, 2 H), 7.08 (dt, *J* = 8.3, 1.0 Hz, 1 H), 6.94–6.91 (m, 2 H), 6.79 (ddd, *J* = 7.3, 4.9, 1.0 Hz, 1 H), 4.85 (s, 3 H), 3.83 (s, 3 H), 3.26 (s, 3 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 163.1, 159.7, 147.6, 137.6,

130.7, 128.4, 116.1, 113.9, 109.3, 75.4, 55.3, 40.0; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{14}H_{17}N_2O_2$: 245.1285, found 245.1289; HPLC retention time 7.86 min.

***O*-(4-Methoxybenzyl)-*N*-(prop-1-yl)-*N*-(pyridin-2-yl)hydroxylamine (30b)**. This compound was prepared according to general procedure **D** using compound **29b** (230.0 mg, 1.18 mmol), 2-bromopyridine (0.10 mL, 1.00 mmol), $Pd_2(dba)_3$ (18.0 mg, 0.02 mmol), (±) BINAP (25.0 mg, 0.04 mmol), and NaO^{t}Bu (134.0 mg, 1.40 mmol) in 9 mL of toluene for 72 h. Purification (1 x 6 in silica gel column; 5%–20% EtOAc in hexanes) provided the desired product (**30b**) in 51% yield as a clear, colorless liquid (140.0 mg, 0.51 mmol). ^{1}H-NMR (300 MHz, $CDCl_3$) δ 8.27 (ddd, *J* = 4.9, 1.7, 0.8 Hz, 1 H), 7.56 (ddd, *J* = 8.3, 7.2, 1.9 Hz, 1 H), 7.39 (d, *J* = 8.6 Hz, 2 H), 7.08 (d, *J* = 8.3 Hz, 1 H), 6.93 (d, *J* = 8.6 Hz, 2 H), 6.77 (ddd, *J* = 7.3, 4.9, 0.8 Hz, 1 H), 4.82 (s, 2 H), 3.83 (s, 3 H), 3.71–3.63 (m, 2 H), 1.80–1.66 (m, 2 H), 0.96 (t, *J* = 7.3 Hz, 3 H); ^{13}C-NMR (75 MHz, $CDCl_3$) δ 162.7, 159.7, 147.8, 137.7, 130.6, 128.3, 115.8, 113.9, 109.1, 75.8, 55.3, 55.2, 19.6, 11.6; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{16}H_{21}N_2O_2$: 273.1598, found 273.1588; HPLC retention time 9.25 min.

***N*-(Hex-1-yl)-*O*-(4-methoxybenzyl)-*N*-(pyridin-2-yl)hydroxylamine (30c)**. This compound was prepared according to general procedure **D** using crude compound **29c** (245.0 mg, 1.03 mmol), 2-bromopyridine (135.6 mg, 0.86 mmol), $Pd_2(dba)_3$ (15.7 mg, 0.017 mmol), (±) BINAP (21.4 mg, 0.034 mmol), and NaO^{t}Bu (115.5 mg, 1.20 mmol) in 8 mL of toluene for 72 h. Purification (1 x 8 in silica gel column; 5%–10% EtOAc in hexanes) provided the desired product (**30c**) in 40% yield as a clear, colorless liquid (107.3 mg, 0.34 mmol). ^{1}H-NMR (500 MHz, $CDCl_3$) δ 8.28–8.24 (m, 1 H), 7.56 (ddd, *J* = 8.6, 7.0, 1.9 Hz, 1 H), 7.38 (d, *J* = 8.4 Hz, 2 H), 7.09–7.04 (m, 1 H), 6.92 (d, *J* = 8.4 Hz, 2 H), 6.79–6.74 (m, 1 H), 4.81 (s, 2 H), 3.83 (s, 3 H), 3.71–3.66 (m, 2 H), 1.71–1.62 (m, 2 H), 1.39–1.23 (m, 8 H), 0.91–0.85 (m, 3 H); ^{13}C-NMR (125 MHz, $CDCl_3$) δ 162.7, 159.7, 147.8, 137.7, 130.6, 128.4, 115.8, 113.9, 109.1, 75.8, 55.3, 53.5, 31.8, 26.9, 26.2, 22.6, 14.1; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{19}H_{27}N_2O_2$: 315.2067, found 315.2058; HPLC retention time 11.41 min.

***O*-(4-Methoxybenzyl)-*N*-(pheneth-2-yl)-*N*-(pyridin-2-yl)hydroxylamine (30e)**. This compound was prepared according to general procedure **D** using compound **29e** (308.8 mg, 1.20 mmol), 2-bromopyridine (0.10 mL, 1.00 mmol), $Pd_2(dba)_3$ (18.0 mg, 0.02 mmol), (±) BINAP (25.0 mg, 0.04 mmol), and NaO^{t}Bu (134.0 mg, 1.40 mmol) in 9 mL of toluene for 60 h. Purification (1 x 6 in silica gel column; 5%–20% EtOAc in hexanes) provided the desired

product (**30e**) in 49% yield as a clear, colorless liquid (163.8 mg, 0.49 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.30–8.28 (m, 1H), 7.57 (ddd, *J* = 8.4, 7.2, 2.0 Hz, 1 H), 7.40–7.36 (m, 2 H), 7.31–7.24 (m, 5 H), 7.22–7.18 (m, 1 H), 7.11–7.08 (m, 1 H), 6.95–6.91 (m, 2 H), 6.81–6. 78 (m, 1 H), 4.82 (s, 2 H), 3.99–3.93 (m, 2 H), 3.84 (s, 3 H), 2.99–2.92 (m, 2 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 162.2, 159.7, 147.9, 139.9, 137.7, 130.7, 128.9, 128.3, 126.0, 116.0, 113.9, 109.3, 75.8, 55.3, 54.5, 32.3; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{21}H_{23}N_2O_2$: 335.1754, found 335.1755; HPLC retention time 10.40 min.

***N*-Allyl-*O*-(4-methoxybenzyl)-*N*-(pyridin-2-yl)hydroxylamine (30f)**. This compound was prepared according to general procedure **D** using compound **29f** (198.8 mg, 1.03 mmol), 2-bromopyridine (130.7 mg, 0.83 mmol), $Pd_2(dba)_3$ (15.2 mg, 0.017 mmol), (±) BINAP (20.7 mg, 0.033 mmol), and NaO^tBu (111.7 mg, 1.16 mmol) in 7.5 mL of toluene for 66 h. Purification (1 x 6 in silica gel column; 5%–20% EtOAc in hexanes) provided the desired product (**30f**) in 54% yield as a clear, colorless liquid (120.8 mg, 0.45 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.26 (ddd, *J* = 4.8, 1.9, 0.9 Hz, 1 H), 7.59–7.54 (m, 1 H), 7.39–7.36 (m, 2 H), 7.09 (dt, *J* = 8.5, 0.9 Hz, 1 H), 6.93–6.90 (m, 2 H), 6.79 (ddd, *J* = 7.3, 4.8, 1.0 Hz, 1 H), 6.05–5.97 (m, 1 H), 5.32–5.27 (m, 1 H), 5.20 (dddd, *J* = 10.3, 1.9, 1.2, 1.0 Hz, 1 H), 4.83 (s, 2 H), 4.34 (dt, *J* = 6.5, 1.2 Hz, 3 H), 3.83 (s, 3 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 162.2, 159.7, 147.7, 137.8, 133.7, 130.7, 128.3, 118.4, 116.2, 113.8, 109.3, 76.0, 56.0, 55.3; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{16}H_{19}N_2O_2$: 271.1441, found 271.1436; HPLC retention time 8.82 min.

***O*-(4-Methoxybenzyl)-*N*-(3-phenoxybenzyl)-*N*-(pyridin-2-yl)hydroxylamine (30g)**. This compound was prepared according to general procedure **D** using compound **29g** (138.7 mg, 0.41 mmol), 2-bromopyridine (54.4 mg, 0.34 mmol), $Pd_2(dba)_3$ (6.3 mg, 0.007 mmol), (±) BINAP (8.58 mg, 0.014 mmol), and NaO^tBu (46.4 mg, 0.48 mmol) in 3.1 mL of toluene for 70 h. Purification (1 x 8 in silica gel column; 5%–30% EtOAc in hexanes) provided the desired product (**30g**) in 59% yield as a clear, colorless liquid (84.2 mg, 0.20 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.27 (ddd, *J* = 4.8, 1.9, 0.9 Hz, 1 H), 7.59–7.55 (m, 1 H), 7.33–7.27 (m, 3 H), 7.22–7.19 (m, 2 H), 7.18–7.16 (m, 1 H), 7.11 - 7.06 (m, 3 H), 6.99–6.96 (m, 2 H), 6.95 (ddd, *J* = 8.1, 2.5, 1.2 Hz, 1 H), 6.88–6.85 (m, 2 H), 6.81 (ddd, *J* = 7.2, 4.8, 0.9 Hz, 1 H), 4.83 (s, 2 H), 4.62 (s, 2 H), 3.82 (s, 3 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 162.2, 159.7, 157.2, 157.0, 147.7, 139.7, 137.9, 130.7, 129.7, 129.4, 128.0, 124.5, 123.1, 120.0, 118.8, 117.8, 116.4, 113.8, 109.2,

76.2, 57.1, 55.3; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{26}H_{25}N_2O_3$: 413.1860, found 413.1865; HPLC retention time 11.18 min.

***O*-(4-Methoxybenzyl)-*N*-(4-(trifluoromethyl)benzyl)-*N*-(pyridin-2-yl)hydroxylamine (30h)**. This compound was prepared according to general procedure **D** using compound **29h** (310.0 mg, 1.00 mmol), 2-bromopyridine (131.1 mg, 0.83 mmol), $Pd_2(dba)_3$ (15.2 mg, 0.017 mmol), (±) BINAP (20.7 mg, 0.033 mmol), and NaO^{t}Bu (111.7 mg, 1.16 mmol) in 7.5 mL of toluene for 96 h. Purification (1 x 8 in silica gel column; 5%–30% EtOAc in hexanes) provided the desired product (**30h**) in 56% yield as a clear, colorless liquid (180.0 mg, 0.46 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.30 (ddd, J = 5.0, 1.8, 0.9 Hz, 1 H), 7.60 (ddd, J = 8.4, 7.2, 2.0 Hz, 1 H), 7.58–7.54 (m, 2 H), 7.52–7.49 (m, 2 H), 7.20–7.17 (m, 2 H), 7.12–7.09 (m, 1 H), 6.88–6.83 (m, 3 H), 4.91 (s, 2 H), 4.64 (s, 2 H), 3.81 (s, 3 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 162.0, 159.7, 147.8, 141.8, 138.0, 130.7, 129.6, 129.35 (q, J_{C-F} = 32.5 Hz), 127.9, 125.0 (q, J_{C-F} = 3.9 Hz), 123.3, 116.6, 113.8, 109.2, 76.2, 56.7, 55.2; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{21}H_{20}F_3N_2O_2$: 389.1471, found 389.1458; HPLC retention time 10.67 min.

***O*-(4-Methoxybenzyl)-*N*-(4-(trifluoromethoxy)benzyl)-*N*-(pyridin-2-yl)hydroxylamine (30i)**. This compound was prepared according to general procedure **D** using compound **29i** (290.0 mg, 0.89 mmol), 2-bromopyridine (116.7 mg, 0.74 mmol), $Pd_2(dba)_3$ (13.5 mg, 0.015 mmol), (±) BINAP (18.4 mg, 0.029 mmol), and NaO^{t}Bu (99.3 mg, 1.03 mmol) in 6 mL of toluene for 96 h. Purification (1 x 8 in silica gel column; 5%–10% EtOAc in hexanes) provided the desired product (**30i**) in 52% yield as a clear, colorless liquid (155.0 mg, 0.04 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.31 (ddd, J = 4.8, 1.9, 0.9 Hz, 1 H), 7.59 (ddd, J = 8.5, 7.2, 1.9 Hz, 1 H), 7.46–7.41 (m, 2 H), 7.19–7.15 (m, 4 H), 7.10 (dt, J = 8.3, 1.0 Hz, 1 H), 6.88–6.85 (m, 2 H), 6.84 (ddd, J = 7.3, 4.8, 1.0 Hz, 1 H), 4.85 (s, 2 H), 4.61 (s, 2 H), 3.82 (s, 3 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 162.1, 159.8, 148.4 (q, J_{C-F} = 1.9 Hz), 147.8, 138.0, 136.4, 130.9, 130.7, 127.9, 120.6, 120.5 (q, J_{C-F} = 256.9 Hz), 116.6, 113.8, 109.2, 76.2, 56.5, 55.2; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{21}H_{20}F_3N_2O_3$: 405.1421, found 405.1425; HPLC retention time 10.86 min.

***N*-Methyl-*N*-(pyridin-2-yl)hydroxylamine (31a).** This compound was prepared according to general procedure **E** using compound **30a** (93.0 mg, 0.38 mmol) and triethylsilane (0.18 mL, 1.13 mmol) in 6 mL of TFA:CH_2Cl_2 (30% TFA v/v) for 7 h. Purification (0.5 x 5 in silica gel column; 17%–33% EtOAc in hexanes) provided the desired product (**31a**) in 55% yield as a viscous faint yellow oil (26.0 mg, 0.21 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.24 (d, J = 4.1

Hz, 1 H), 7.60 (t, *J* = 8.2 Hz, 1 H), 7.02 (d, *J* = 8.5 Hz, 1 H), 6.84–6.82 (m, 1 H), 3.30 (s, 3 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 162.9, 146.8, 137.7, 116.1, 109.3, 42.8; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_6H_9N_2O$: 125.0709, found 125.0696; HPLC retention time 2.78 min.

***N*-(Prop-1-yl)-*N*-(pyridin-2-yl)hydroxylamine (31b).** This compound was prepared according to general procedure **E** using compound **30b** (100.0 mg, 0.37 mmol) and triethylsilane (0.15 mL, 0.94 mmol) in 10 mL of TFA:CH_2Cl_2 (30% TFA v/v) for 5 h. Purification (0.75 in x 6 in silica gel column; 20% EtOAc in hexanes) provided the desired product (**31b**) in 75% yield as a clear, colorless oil (42.0 mg, 0.28 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.22 (d, *J* = 4.1 Hz, 1 H), 7.57 (t, *J* = 7.2 Hz, 1 H), 7.00 (d, *J* = 8.5 Hz, 1 H), 6.81–6.76 (m, 1 H), 3.56 (t, *J* = 7.3 Hz, 2 H), 1.76 (dq, *J* = 14.7, 7.3 Hz, 2 H), 0.99 (t, *J* = 7.3 Hz, 3 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 162.1, 146.7, 137.6, 115.7, 109.3, 56.9, 19.6, 11.5; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_8H_{13}N_2O$: 153.1022, found 153.1031. HPLC retention time 4.44 min.

***N*-(Hex-1-yl)-*N*-(pyridin-2-yl)hydroxylamine (31c).** This compound was prepared according to general procedure **E** using compound **30c** (35.9 mg, 0.11 mmol) and triethylsilane (0.12 mL, 0.75 mmol) in 6 mL of TFA:CH_2Cl_2 (30% TFA v/v) for 5 h. Purification (0.5 x 4 in silica gel column; 20% EtOAc in hexanes) provided the desired product (**31c**) in 69% yield as a clear, faint yellow oil (15.2 mg, 0.08 mmol). ^{1}H-NMR (500 MHz, $CDCl_3$) δ 8.20 (d, *J* = 3.2 Hz, 1 H), 7.56 (t, *J* = 7.5 Hz, 1 H), 6.99 (d, *J* = 8.2 Hz, 1 H), 6.77 (t, *J* = 5.3 Hz, 1 H), 3.58 (t, *J* = 7.1 Hz, 2 H), 1.75–1.65 (m, 2 H), 1.41–1.24 (m, 6 H), 0.91–0.85 (m, 3 H); ^{13}C-NMR (125 MHz, $CDCl_3$) δ 162.2, 146.7, 137.7, 115.6, 109.4, 55.2, 31.7, 26.7, 26.2, 22.6, 14.0; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{11}H_{19}N_2O$: 195.1492, found 195.1473; HPLC retention time 7.82 min.

***N*-(Pheneth-2-yl)-*N*-(pyridin-2-yl)hydroxylamine (31e).** This compound was prepared according to general procedure **E** using compound **30e** (105.0 mg, 0.31 mmol) and triethylsilane (0.10 mL, 0.63 mmol) in 10 mL of TFA:CH_2Cl_2 (30% TFA v/v) for 20 h. Purification (0.75 x 6 in silica gel column; 20%–25% EtOAc in hexanes) provided the desired product (**31e**) in 73% yield as a viscous yellow oil (49.0 mg, 0.23 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.24 (d, *J* = 4.1 Hz, 1 H), 7.60–7.54 (m, 1 H), 7.33–7.24 (m, 5 H), 7.24–7.19 (m, 1 H), 7.00 (d, *J* = 8.2 Hz, 1 H), 6.83–6.77 (m, 1 H), 3.92–3.85 (m, 2 H), 3.06–2.99 (m, 2 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 161.8, 146.8, 139.6, 137.7, 128.9, 128.4, 126.2, 115.9, 109.4, 56.5, 32.5; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{13}H_{15}N_2O$: 215.1179, found 215.1192; HPLC retention time 6.95 min.

***N*-Allyl-*N*-(pyridin-2-yl)hydroxylamine (31f).** This compound was prepared according to general procedure **E** using compound **30f** (80.0 mg, 0.30 mmol) and triethylsilane (0.10 mL, 0.63 mmol) in 10 mL of TFA:CH_2Cl_2 (30% TFA v/v) for 5 h. Purification (0.75 x 6 in silica gel column; 20%–25% EtOAc in hexanes) provided the desired product (**31f**) in 45% yield as a faint yellow oil (20.0 mg, 0.13 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.25–8.23 (m, 1 H), 7.60 (ddd, *J* = 8.6, 7.0, 1.8 Hz, 1 H), 7.07 (dt, *J* = 8.5, 0.9 Hz, 1 H), 6.82 (ddd, *J* = 7.0, 5.0, 0.9 Hz, 1 H), 6.02–5.94 (m, 1 H), 5.34 (dq, *J* = 17.2, 1.5 Hz, 1 H), 5.27–5.23 (m, 1 H), 4.29 (dt, *J* = 6.2, 1.3 Hz, 3 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 161.8, 146.8, 137.8, 132.9, 118.9, 116.2, 109.7, 57.6; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_8H_{11}N_2O$: 151.0866, found 151.0880; HPLC retention time 4.18 min.

***N*-(3-Phenoxybenzyl)-*N*-(pyridin-2-yl)hydroxylamine (31g).** This compound was prepared according to general procedure **E** using compound **30g** (35.6 mg, 0.086 mmol) and triethylsilane (0.05 mL, 0.31 mmol) in 6 mL of TFA:CH_2Cl_2 (17% TFA v/v) for 7 h. Purification (0.5 x 4.5 in silica gel column; 10%–20% EtOAc in hexanes) provided the desired product (**31g**) in 60% yield as a white solid (15.1 mg, 0.052 mmol). Mp 81-83 ºC; ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.22 (d, *J* = 4.7 Hz, 1 H), 7.62–7.57 (m, 1 H), 7.35–7.31 (m, 2 H), 7.29 (t, *J* = 7.8 Hz, 1 H), 7.16–7.09 (m, 3 H), 7.08–7.06 (m, 1 H), 7.00–6.97 (m, 2 H), 6.93 (dd, *J* = 8.2, 2.3 Hz, 1 H), 6.83 (dd, *J* = 7.0, 5.0 Hz, 1 H), 4.81 (s, 2 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 162.0, 157.3, 157.0, 147.0, 139.1, 137.8, 129.7, 129.6, 123.7, 123.2, 119.2, 118.9, 117.8, 116.4, 109.7, 58.5; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{18}H_{17}N_2O_2$: 293.1285, found 293.1293; HPLC retention time 8.55 min.

***N*-(4-(Trifluoromethyl)benzyl)-*N*-(pyridin-2-yl)hydroxylamine (31h).** This compound was prepared according to general procedure **E** using compound **30h** (50.0 mg, 0.13 mmol) and triethylsilane (0.05 mL, 0.31 mmol) in 6 mL of TFA:CH_2Cl_2 (30% TFA v/v) for 7 h. The desired product (**31h**) was precipitated by trituration with cold pentanes and isolated in 81% yield as an off-white solid (28.0 mg, 0.10 mmol). Mp 101-102 ºC; ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.24 (dd, *J* = 4.8, 1.0 Hz, 1 H), 7.65–7.61 (m, 1 H), 7.59 (d, *J* = 8.2 Hz, 2 H), 7.52 (d, *J* = 8.2 Hz, 2 H), 7.14 (d, *J* = 8.5 Hz, 1 H), 6.86 (dd, *J* = 6.9, 5.1 Hz, 1 H), 4.88 (s, 2 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 161.9, 147.0, 141.3, 138.0, 129.7 (q, $J_{C\text{-}F}$ = 32.5 Hz), 129.1, 125.3 (q, $J_{C\text{-}F}$ = 3.9 Hz), 123.3, 116.7, 109.6, 58.3; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{13}H_{12}F_3N_2O$: 269.0896, found 269.0892; HPLC retention time 8.19 min.

***N*-(4-(Trifluoromethoxy)benzyl)-*N*-(pyridin-2-yl)hydroxylamine (31i).** This compound was prepared according to general procedure **E** using compound **30i** (108.6 mg, 0.27 mmol) and triethylsilane (0.10 mL, 0.63 mmol) in 9 mL of TFA:CH_2Cl_2 (30% TFA v/v) for 19 h. Purification (0.75 x 6 in silica gel column; 10%–20% EtOAc in hexanes) provided the desired product (**31i**) in 70% yield as an off-white, crystalline solid (53.0 mg, 0.19 mmol). Mp 101.5–103.5 ºC; ^{1}H-NMR (500 MHz, $CDCl_3$) δ ppm 8.20 (d, *J* = 4.8 Hz, 1 H), 7.64–7.57 (m, 1 H), 7.42 (d, *J* = 8.4 Hz, 2 H), 7.19–7.11 (m, 3 H), 6.84 (dd, *J* = 7.1, 5.1 Hz, 1 H), 4.80 (s, 2 H); ^{13}C-NMR (125 MHz, $CDCl_3$) δ ppm 162.1, 148.5 (q, J_{C-F} = 1.6 Hz), 147.0, 138.0, 135.9, 130.3, 120.8, 120.4 (q, J_{C-F} = 256.7 Hz), 116.5, 109.7, 58.0; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{13}H_{12}F_3N_2O_2$: 285.0845, found 285.0834; HPLC retention time 7.68 min.

(±) *O*-Acetyl-*N*-(5-bromopyridin-2-yl)-*N*-((1*S*/*R*,4*S*/*R*)-2-methoxycyclohex-3-enyl)hydroxylamine (35). Compound **7b** (22.0 mg, 0.074 mmol), Ac_2O (9.0 mg, 0.09 mmol), *i*Pr_2EtN (14.2 mg, 0.11 mmol), and catalytic DMAP (2.0 mg, 0.016 mmol) were dissolved in 4 mL of anhydrous CH_2Cl_2, respectively. After 9h, TLC (20% EtOAc in hexanes) showed complete consumption of the starting hydroxylamine compound. The CH_2Cl_2 was evaporated and the crude product was purified by silica gel column chromatography (0.5 x 6 in silica gel; 10%–25% EtOAc in hexanes) to give the desired product (**35**) in 94% yield as a clear, colorless oil (23.5 mg, 0.07 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.33 (d, *J* = 2.0 Hz, 1 H), 7.66 (dd, *J* = 8.8, 2.3 Hz, 1 H), 6.68–6.64 (m, 1 H), 5.85–5.80 (m, 1 H), 5.78–5.70 (m, 1 H), 4.71–4.65 (m, 1 H), 4.12 (br s, 1 H), 3.39 (br s, 3 H), 2.28 (s, 3 H), 2.27–2.20 (m, 1 H), 2.19–2.12 (m, 1 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 169.5, 159.3, 148.5, 140.1, 129.4, 126.5, 112.0, 110.5, 75.6, 62.1, 55.5, 29.7, 25.3, 18.7; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{14}H_{18}BrN_2O_3$: 341.0495, found 341.0512; IR (neat): 3028.7, 1786.6, 1577.8, 1458.7, 1371.0, 1181.8, 1098.1, 1000.6 cm^{-1}; HPLC retention time 7.93 min.

***N*-Benzyl-*O*-(4-methoxybenzyl)-*N*-(pyridin-3-yl)hydroxylamine (36).** This compound was prepared according to general procedure **D** using compound **29d** (279.0 mg, 1.15 mmol), 3-bromopyridine (158.0 mg, 1.00 mmol), $Pd_2(dba)_3$ (18.0 mg, 0.02 mmol), (±) BINAP (25.0 mg, 0.04 mmol), and NaO^{t}Bu (134.0 mg, 1.40 mmol) in 9 mL of toluene for 67 h. Purification (1.25 x 8 in silica gel column; 10%–50% EtOAc in hexanes) provided the desired product (**36**) in 36% yield as a clear, yellow liquid (115 mg, 0.36 mmol). ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.49 (d, *J* = 2.6 Hz, 1 H), 8.25 (dd, *J* = 4.7, 1.5 Hz, 1 H), 7.45–7.41 (m, 3 H), 7.38–7.31 (m, 3 H), 7.20 (ddd,

J = 8.4, 4.7, 0.7 Hz, 1 H), 7.13–7.10 (m, 2 H), 6.85–6.82 (m, 2 H), 4.51 (s, 2 H), 4.42 (s, 2 H), 3.80 (s, 3 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 159.6, 147.4, 143.7, 139.6, 136.5, 130.7, 129.4, 128.3, 128.0, 127.7, 124.0, 123.3, 113.7, 75.8, 63.2, 55.2; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{20}H_{21}N_2O_2$: 321.1598, found 321.1618; IR (neat): 3060.7, 3031.9, 3005.0, 1611.5, 1572.5, 1513.1, 1246.8, 1030.2, 985.1 cm^{-1}; HPLC retention time 8.70 min.

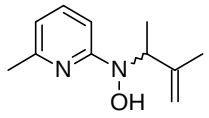
***N*-Benzyl-*N*-(pyridin-3-yl)hydroxylamine (37).** This compound was prepared according to general procedure **E** using compound **36** (49.5 mg, 0.15 mmol) and triethylsilane (0.05 mL, 0.31 mmol) in 7 mL of TFA:CH_2Cl_2 (15% TFA v/v) for 30 h. Purification (0.5 x 4 in silica gel column; 30%–50% EtOAc in hexanes) provided the desired product (**37**) in 45% yield as an off-white solid (14.0 mg, 0.07 mmol). Mp 126–130 ºC; ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.49–8.45 (m, 1 H), 8.16–8.11 (m, 1 H), 7.52 (dt, *J* = 8.4, 1.2 Hz, 1 H), 7.44–7.39 (m, 2 H), 7.36 (t, *J* = 7.2 Hz, 2 H), 7.34–7.30 (m, 1 H), 7.21 (dd, *J* = 8.2, 4.7 Hz, 1 H), 6.69 (br s, N–OH, 1 H), 4.45 (s, 2 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 148.7, 142.7, 138.5, 136.6, 129.0, 128.5, 127.7, 123.4, 123.3, 63.3; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{12}H_{13}N_2O$: 201.1022, found 201.1026; IR (neat) 3088.0 (br), 3062.3, 3033.1, 1572.5, 1487.0, 1422.5, 1232.0, 1189.8, 1062.9, 1002.8 cm^{-1}; HPLC retention time 5.32 min.

***N*-Benzyl-*N*-hydroxy(pyridin-2-yl)methanamine (39).** This compound was prepared according to general procedure **E** using compound **38** (15.0 mg, 0.045 mmol) and triethylsilane (0.025 mL, 0.16 mmol) in 3.5 mL of TFA:CH_2Cl_2 (15% TFA v/v) for 5 h. The desired product (**39**) was precipitated by trituration with cold pentanes and isolated in 73% yield as an off-white solid (7.0 mg, 0.033 mmol). Mp 80–82 ºC; ^{1}H-NMR (600 MHz, $CDCl_3$) δ 8.60–8.57 (m, 1 H), 7.69 (td, *J* = 7.6, 1.8 Hz, 1 H), 7.45–7.41 (m, 2 H), 7.38–7.33 (m, 3 H), 7.32–7.28 (m, 1 H), 7.22 (ddd, *J* = 7.6, 4.9, 1.0 Hz, 1 H), 4.09 (s, 2 H), 4.04 (s, 2 H); ^{13}C-NMR (150 MHz, $CDCl_3$) δ 157.7, 148.9, 136.8, 129.6, 128.4, 127.5, 123.3, 122.4, 64.3, 64.0; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{13}H_{15}N_2O$: 215.1179, found 215.1161; IR (neat): 3144.6 (br), 3063.9, 3031.5, 1597.7, 1435.1, 1117.4, 1031.5 cm^{-1}; HPLC retention time 5.13 min.

(±) (*E*)-6-(*N*-Hydroxy-*N*-(6-ethylpyridin-2-yl)amino)-3,7-dimethylocta-2,7-dien-1-ol (40a). This compound was prepared according to general procedure **A** using geraniol (453.2 mg, 2.94 mmol) and 6-ethyl-2-nitrosopyridine **10** (200.0 mg, 1.46 mmol) in 5 mL of CH_2Cl_2 for 25 min. Purification (1 x 6 in silica gel column; 10%–25% EtOAc in hexanes) provided a mixture of isomers (**40a**:**40b**; 70:30) in 75% yield as a yellow oil (321.0 mg, 1.10 mmol). Further

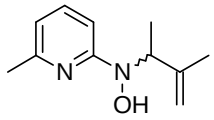
purification (1 x 6 in silica gel; 33%–50% EtOAc in hexanes) provided an analytically pure sample of isomer **40a** as a yellow oil (50.0 mg, 0.17 mmol). ^{1}H-NMR (600 MHz, DMSO-d_6) δ ppm 8.73 (s, 1 H), 7.46 (dd, *J* = 8.2, 7.3 Hz, 1 H), 6.82 (d, *J* = 8.2 Hz, 1 H), 6.53 (d, *J* = 7.0 Hz, 1 H), 5.27–5.23 (m, 1 H), 4.99 (t, *J* = 7.0 Hz, 1 H), 4.87–4.84 (m, 1 H), 4.80–4.78 (m, 1 H), 4.40 (t, *J* = 5.3 Hz, 1 H), 3.92 (t, *J* = 5.7 Hz, 2 H), 2.57 (q, *J* = 7.4 Hz, 2 H), 2.09–1.96 (m, 2 H), 1.93–1.72 (m, 2 H), 1.66 (s, 3 H), 1.57 (s, 3 H), 1.19–1.14 (m, 3 H); ^{13}C-NMR (150 MHz, DMSO-d_6) δ ppm 162.7, 160.0, 144.6, 137.7, 135.7, 125.2, 112.7, 111.9, 105.2, 62.5, 57.6, 36.2, 30.5, 27.4, 21.4, 16.2, 13.5; HRMS-ESI (m/z): $[M+H]^+$ calcd. for $C_{17}H_{27}N_2O_2$: 291.2067, found 291.2075; HPLC retention time 7.82 min.

V. Copies of ^{1}H-NMR and ^{13}C-NMR Spectra



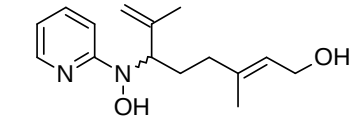
(±) **9**

^{1}H-NMR (600 MHz, DMSO-d_6)



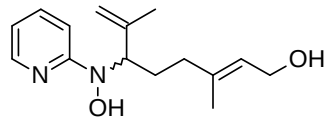
(±) **9**

^{13}C-NMR (150 MHz, DMSO-d_6)



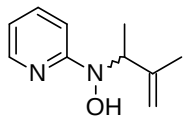
(±) **11a**

^{1}H-NMR (600 MHz, DMSO-d_6)



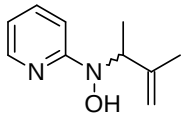
(±) **11a**

^{13}C-NMR (150 MHz, DMSO-d_6)



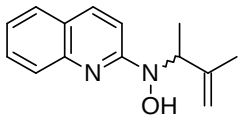
(±) **12**

^{1}H-NMR (600 MHz, DMSO-d_6)



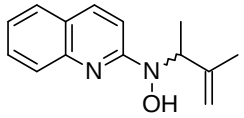
(±) **12**

^{13}C-NMR (150 MHz, DMSO-d_6)



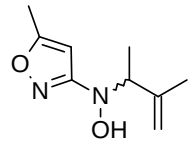
(±) **14**

^{1}H-NMR (600 MHz, DMSO-d_6)



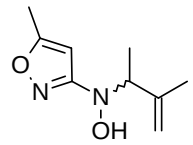
(±) **14**

^{13}C-NMR (150 MHz, DMSO-d_6)



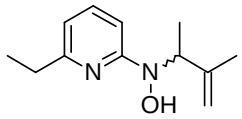
(±) **16**

^{1}H-NMR (600 MHz, DMSO-d_6)



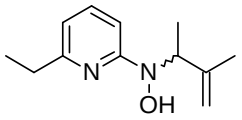
(±) **16**

^{13}C-NMR (150 MHz, DMSO-d_6)



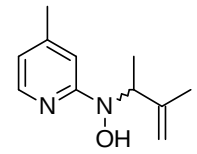
(±) **18a**

^{1}H-NMR (600 MHz, DMSO-d_6)



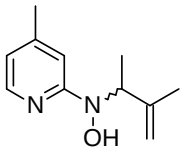
(±) **18a**

^{13}C-NMR (150 MHz, DMSO-d_6)



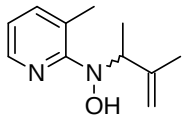
(±) **18b**

^{1}H-NMR (600 MHz, DMSO-d_6)



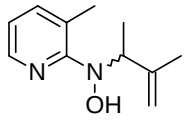
(±) **18b**

^{13}C-NMR (150 MHz, DMSO-d_6)

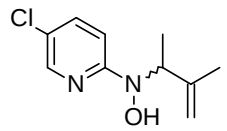


(±) **18c**

^{1}H-NMR (600 MHz, DMSO-d_6)

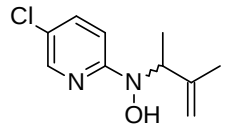


(±) **18c**
^{13}C-NMR (150 MHz, DMSO-d_6)



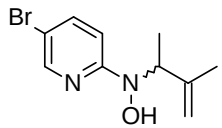
(±) **18d**

^{1}H-NMR (600 MHz, DMSO-d_6)



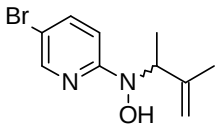
(±) **18d**

^{13}C-NMR (150 MHz, DMSO-d_6)



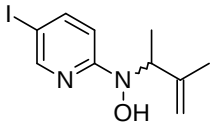
(±) **18e**

^{1}H-NMR (600 MHz, DMSO-d_6)



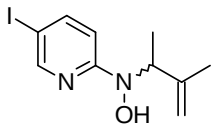
(±) **18e**

^{13}C-NMR (150 MHz, DMSO-d_6)



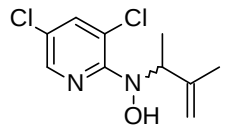
(±) **18f**

^{1}H-NMR (600 MHz, DMSO-d_6)



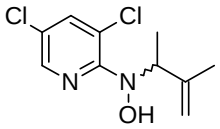
(±) **18f**

^{13}C-NMR (150 MHz, DMSO-d_6)



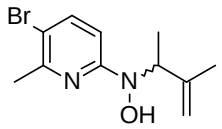
(±) **18g**

^{1}H-NMR (600 MHz, DMSO-d_6)



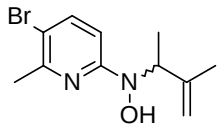
(±) **18g**

^{13}C-NMR (150 MHz, DMSO-d_6)



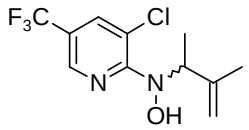
(±) **18h**

^{1}H-NMR (600 MHz, DMSO-d_6)

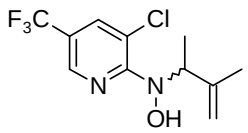


(±) **18h**

^{13}C-NMR (150 MHz, DMSO-d_6)

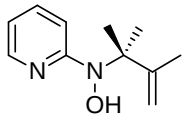


(±) **18i**
^{1}H-NMR (600 MHz, DMSO-d_6)



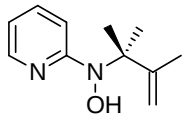
(±) **18i**

^{13}C-NMR (150 MHz, DMSO-d_6)



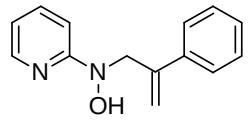
19a

^{1}H-NMR (600 MHz, DMSO-d_6)



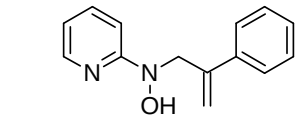
19a

^{13}C-NMR (150 MHz, DMSO-d_6)



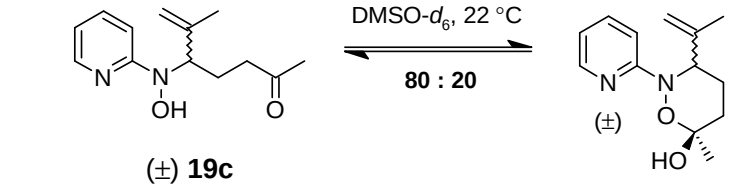
19b

^{1}H-NMR (600 MHz, $CDCl_3$)



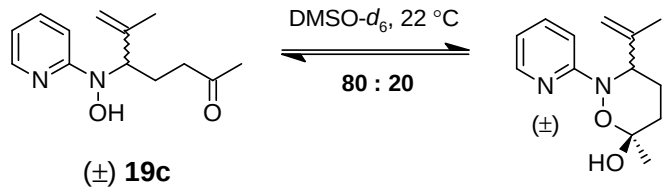
19b

^{13}C-NMR (150 MHz, $CDCl_3$)



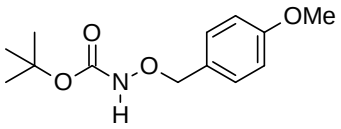
(±) **19c**

^{1}H-NMR (600 MHz, DMSO-d_6)



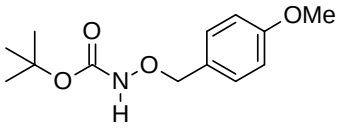
(±) **19c**

^{13}C-NMR (150 MHz, DMSO-d_6)



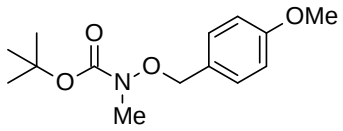
27

^{1}H-NMR (600 MHz, $CDCl_3$)



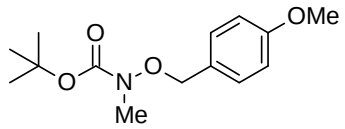
27

^{13}C-NMR (150 MHz, $CDCl_3$)



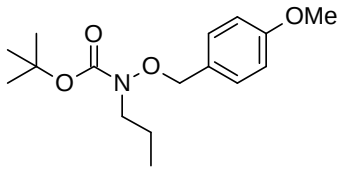
28a

^{1}H-NMR (600 MHz, $CDCl_3$)



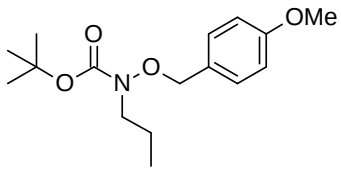
28a

^{13}C-NMR (150 MHz, $CDCl_3$)



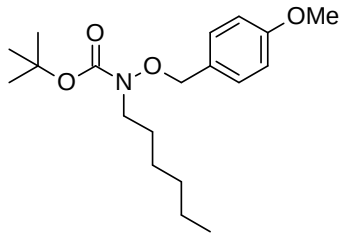
28b

^{1}H-NMR (300 MHz, $CDCl_3$)



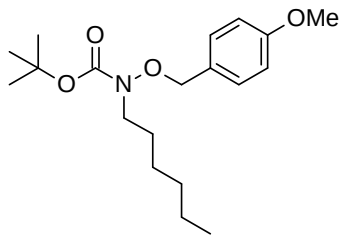
28b

^{13}C-NMR (75 MHz, $CDCl_3$)



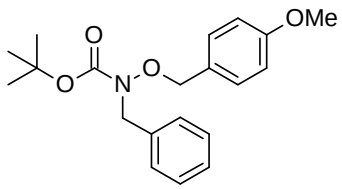
28c

^{1}H-NMR (600 MHz, $CDCl_3$)



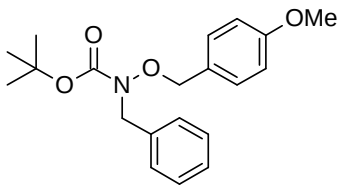
28c

^{13}C-NMR (150 MHz, $CDCl_3$)



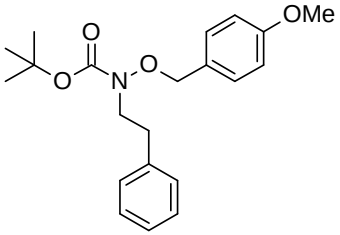
28d

^{1}H-NMR (600 MHz, $CDCl_3$)



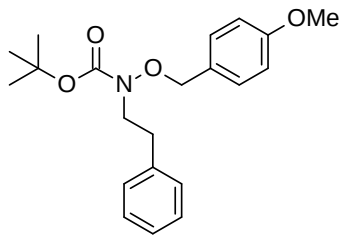
28d

^{13}C-NMR (150 MHz, $CDCl_3$)



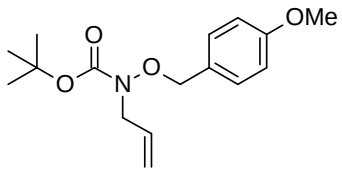
28e

^{1}H-NMR (600 MHz, $CDCl_3$)



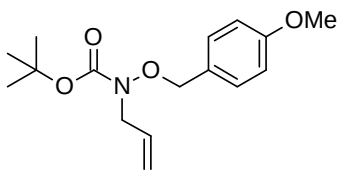
28e

^{13}C-NMR (150 MHz, $CDCl_3$)



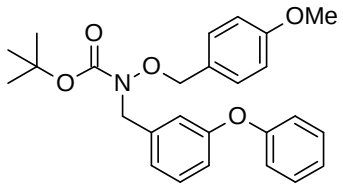
28f

^{1}H-NMR (600 MHz, $CDCl_3$)



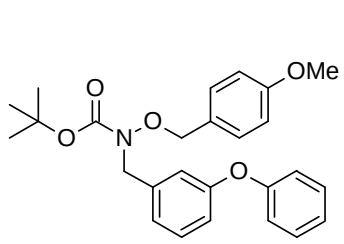
28f

^{13}C-NMR (150 MHz, $CDCl_3$)



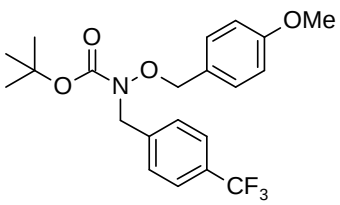
28g

^{1}H-NMR (600 MHz, $CDCl_3$)



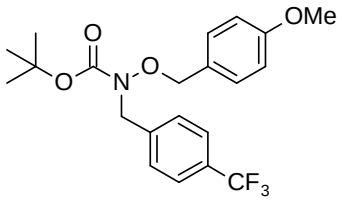
28g

^{13}C-NMR (150 MHz, $CDCl_3$)



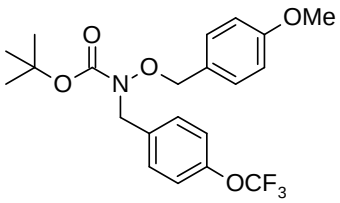
28h

^{1}H-NMR (600 MHz, $CDCl_3$)



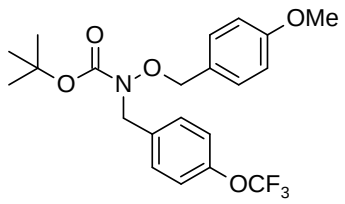
28h

^{13}C-NMR (150 MHz, $CDCl_3$)



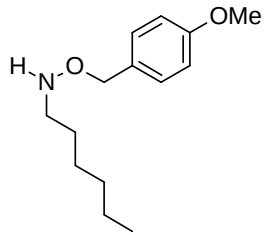
28i

^{1}H-NMR (600 MHz, $CDCl_3$)



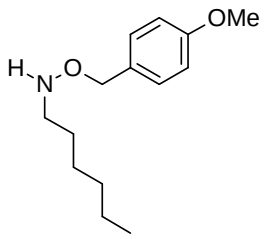
28i

^{13}C-NMR (150 MHz, $CDCl_3$)



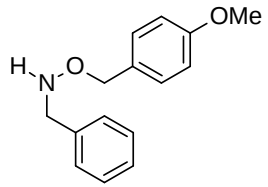
29c

^{1}H-NMR (600 MHz, $CDCl_3$)



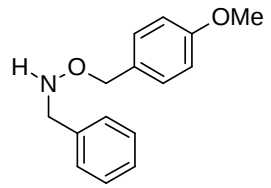
29c

^{13}C-NMR (150 MHz, $CDCl_3$)



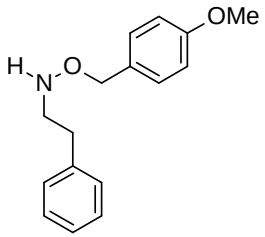
29d

^{1}H-NMR (600 MHz, $CDCl_3$)



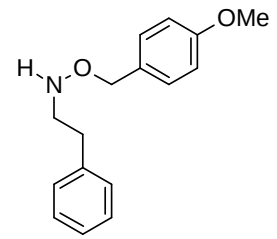
29d

^{13}C-NMR (150 MHz, $CDCl_3$)



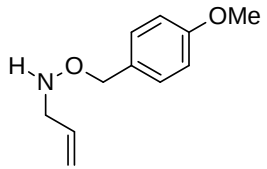
29e

^{1}H-NMR (600 MHz, $CDCl_3$)



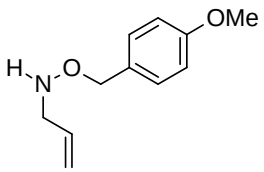
29e

^{13}C-NMR (150 MHz, $CDCl_3$)



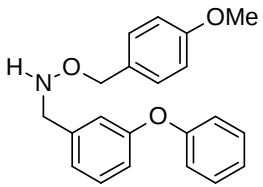
29f

^{1}H-NMR (600 MHz, $CDCl_3$)



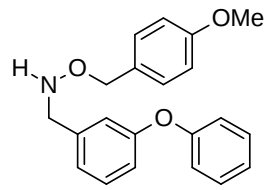
29f

^{13}C-NMR (150 MHz, $CDCl_3$)



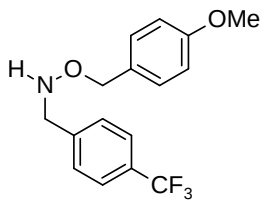
29g

^{1}H-NMR (600 MHz, $CDCl_3$)



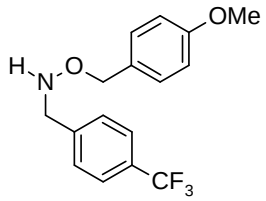
29g

^{13}C-NMR (150 MHz, $CDCl_3$)



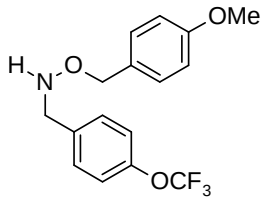
29h

^{1}H-NMR (600 MHz, $CDCl_3$)



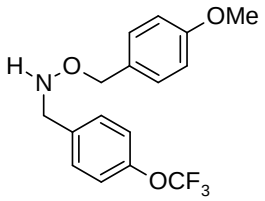
29h

^{13}C-NMR (150 MHz, CDCl3)



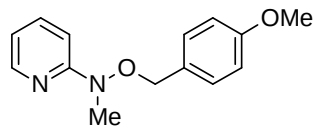
29i

^{1}H-NMR (600 MHz, CDCl3)



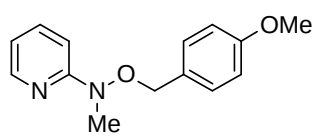
29i

^{13}C-NMR (150 MHz, CDCl3)



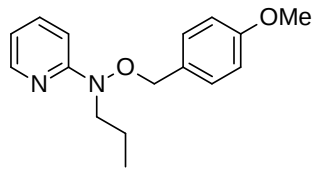
30a

^{1}H-NMR (600 MHz, $CDCl_3$)



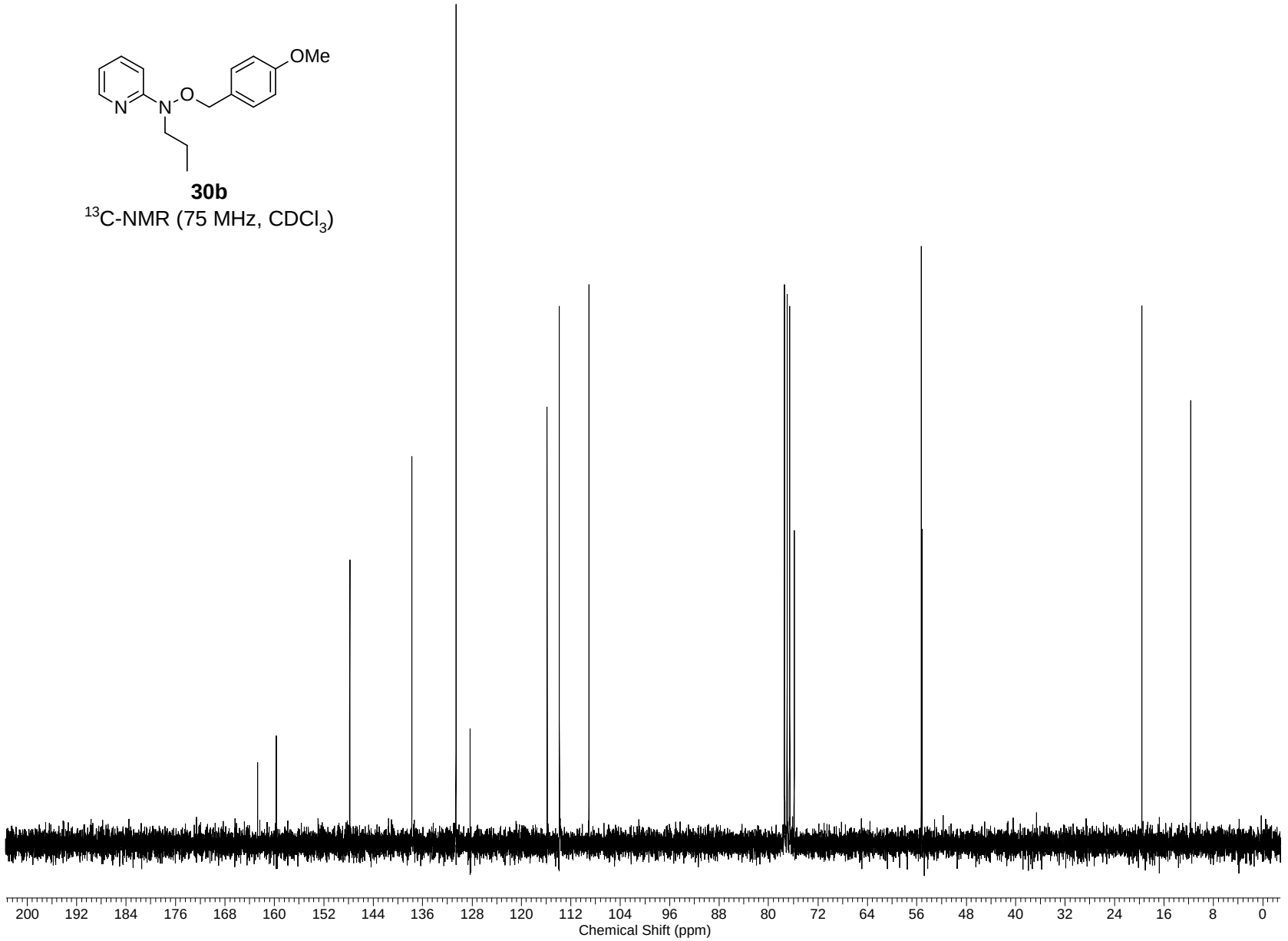
30a

^{13}C-NMR (150 MHz, $CDCl_3$)



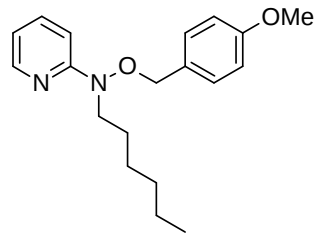
30b

^{1}H-NMR (300 MHz, $CDCl_3$)



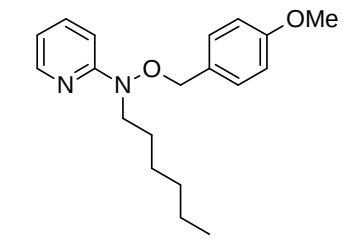
30b

^{13}C-NMR (75 MHz, $CDCl_3$)



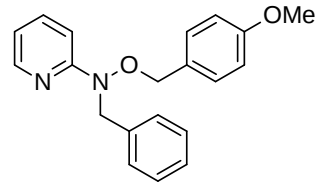
30c

^{1}H-NMR (500 MHz, $CDCl_3$)



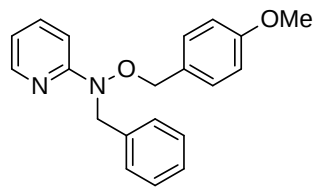
30c

^{13}C-NMR (125 MHz, $CDCl_3$)



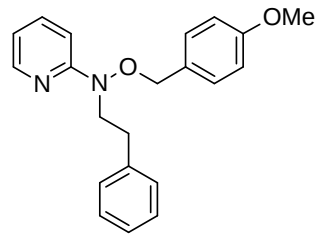
30d

^{1}H-NMR (600 MHz, $CDCl_3$)



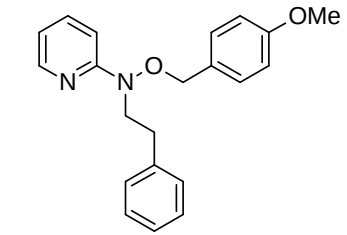
30d

^{13}C-NMR (150 MHz, $CDCl_3$)



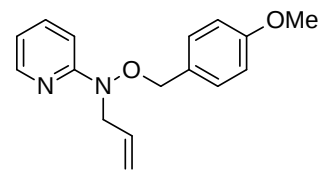
30e

^{1}H-NMR (600 MHz, $CDCl_3$)



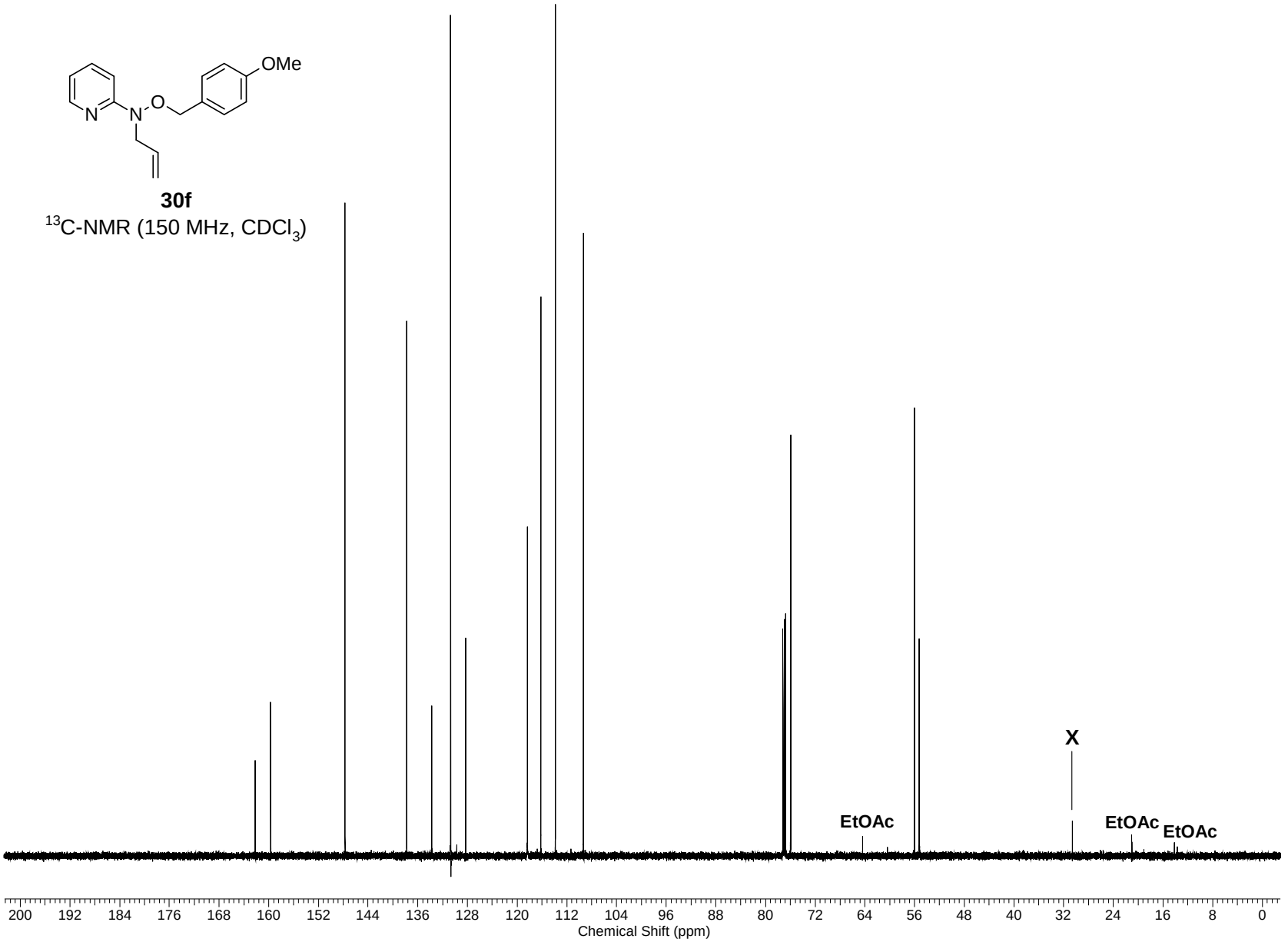
30e

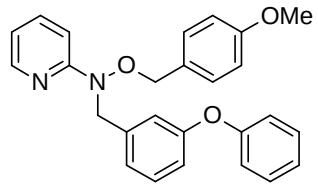
^{13}C-NMR (150 MHz, $CDCl_3$)



30f

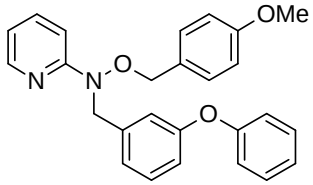
^{1}H-NMR (600 MHz, $CDCl_3$)


OMe
N
N
O
30f
13C-NMR (150 MHz, CDCl3)
X
EtOAc
EtOAc
EtOAc
200 192 184 176 168 160 152 144 136 128 120 112 104 96 88 80 72 64 56 48 40 32 24 16 8 0
Chemical Shift (ppm)



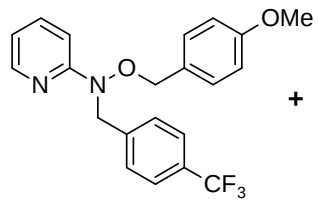
30g

^{1}H-NMR (600 MHz, $CDCl_3$)



30g

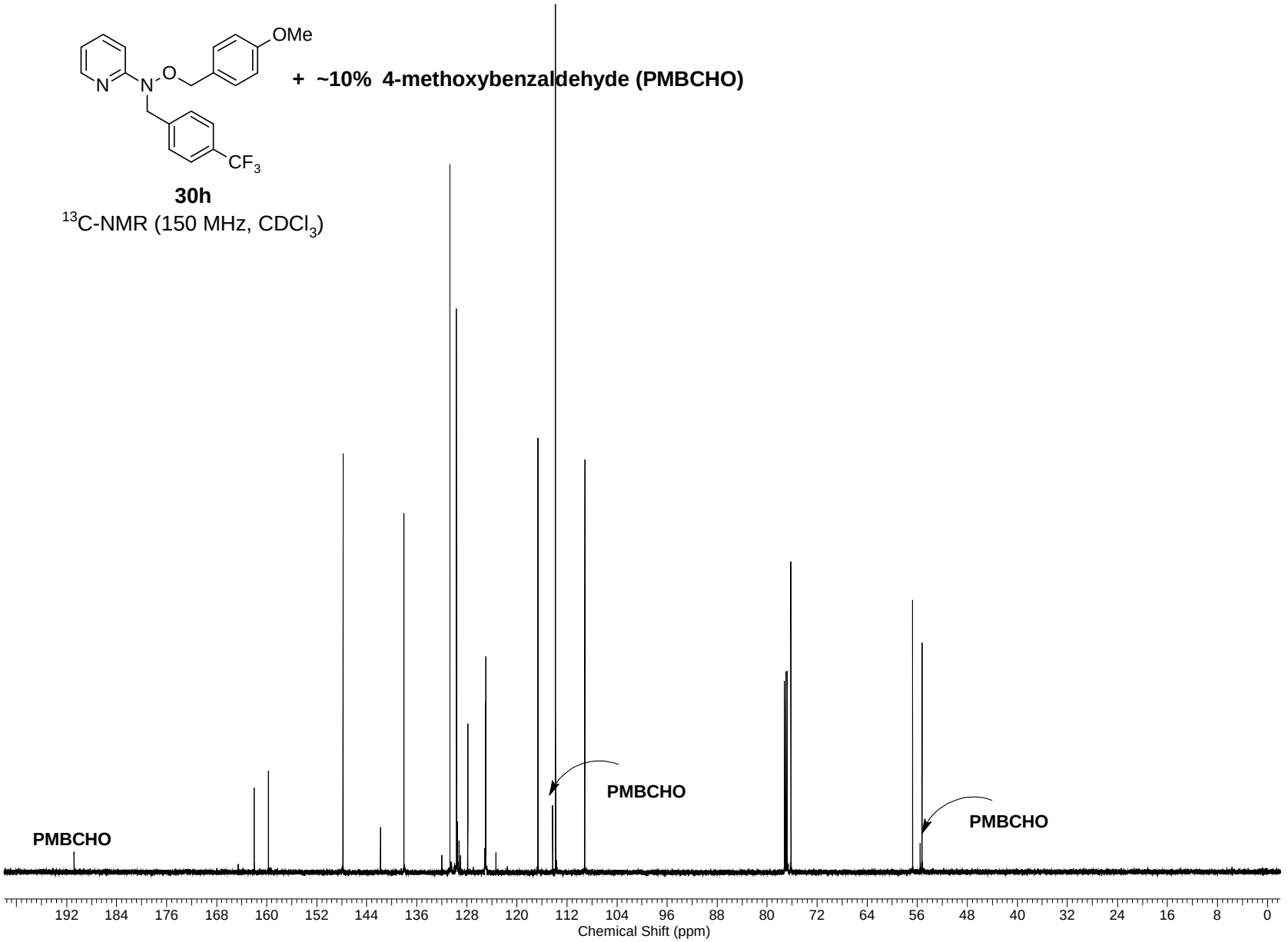
^{13}C-NMR (150 MHz, $CDCl_3$)

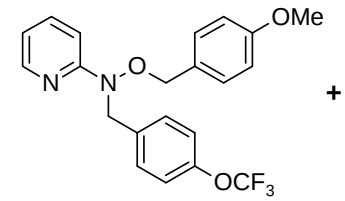


+ ~10% 4-methoxybenzaldehyde (PMBCHO)

30h

^{1}H-NMR (600 MHz, $CDCl_3$)

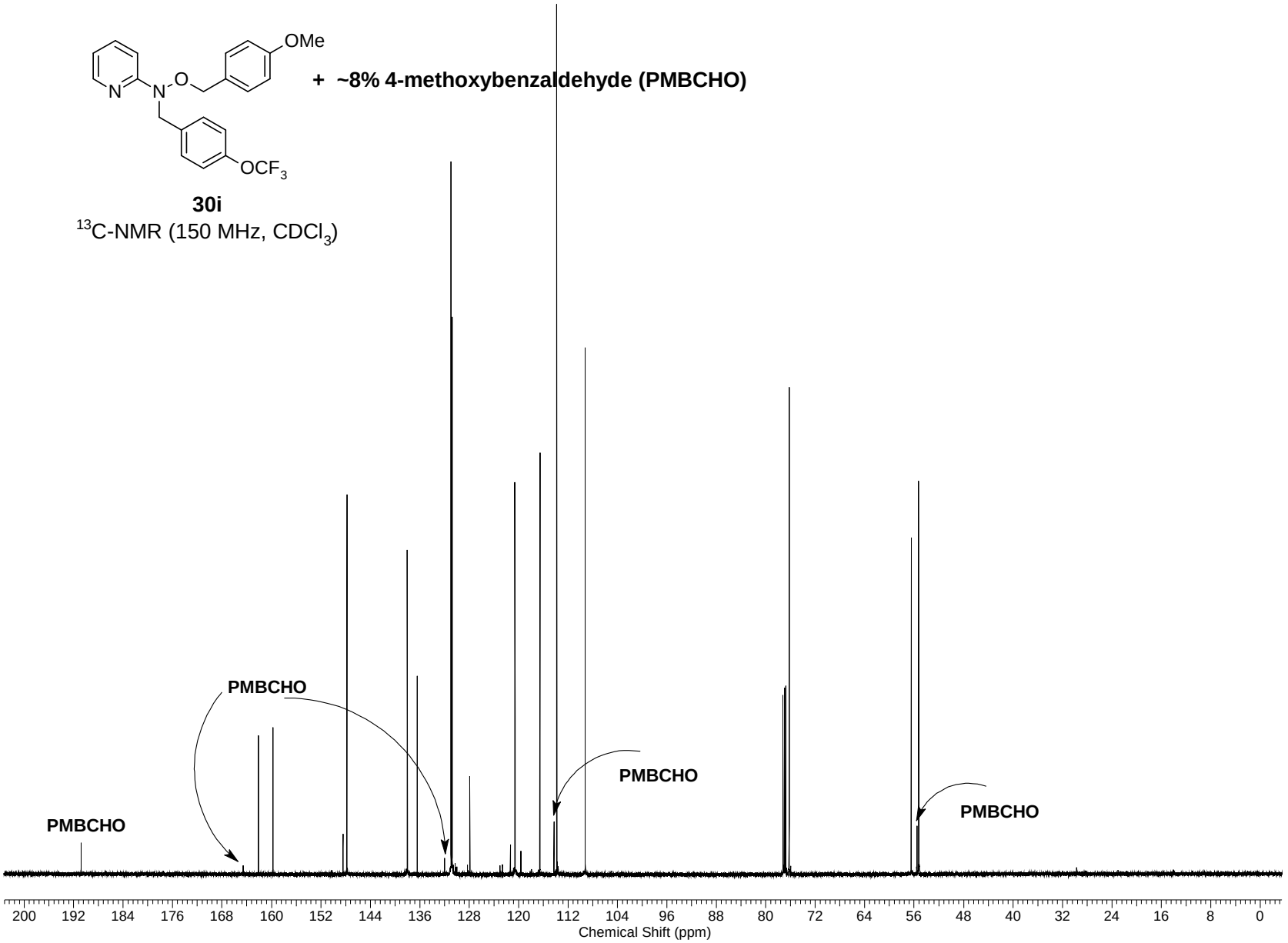

OMe
N
N
O
CF3
+ ~10% 4-methoxybenzaldehyde (PMBCHO)
30h
13C-NMR (150 MHz, CDCl3)
PMBCHO
PMBCHO
PMBCHO
192 184 176 168 160 152 144 136 128 120 112 104 96 88 80 72 64 56 48 40 32 24 16 8 0
Chemical Shift (ppm)

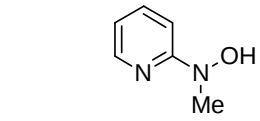


+ ~8% 4-methoxybenzaldehyde (PMBCHO)

30i

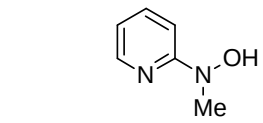
^{1}H-NMR (600 MHz, $CDCl_3$)


OMe
N
N
O
OCF3
+ ~8% 4-methoxybenzaldehyde (PMBCHO)
30i
13C-NMR (150 MHz, CDCl3)
PMBCHO
PMBCHO
PMBCHO
PMBCHO
200 192 184 176 168 160 152 144 136 128 120 112 104 96 88 80 72 64 56 48 40 32 24 16 8 0
Chemical Shift (ppm)



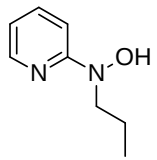
31a

^{1}H-NMR (600 MHz, $CDCl_3$)



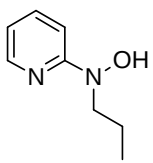
31a

^{13}C-NMR (150 MHz, $CDCl_3$)



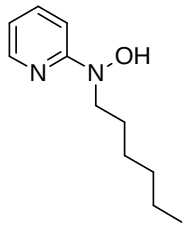
31b

^{1}H-NMR (600 MHz, $CDCl_3$)



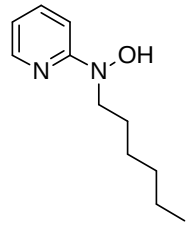
31b

^{13}C-NMR (150 MHz, $CDCl_3$)



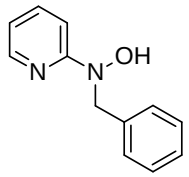
31c

^{1}H-NMR (600 MHz, $CDCl_3$)



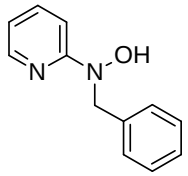
31c

^{13}C-NMR (150 MHz, $CDCl_3$)



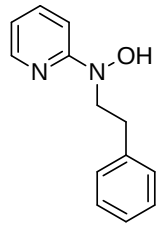
31d

^{1}H-NMR (600 MHz, $CDCl_3$)



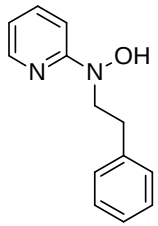
31d

^{13}C-NMR (150 MHz, $CDCl_3$)



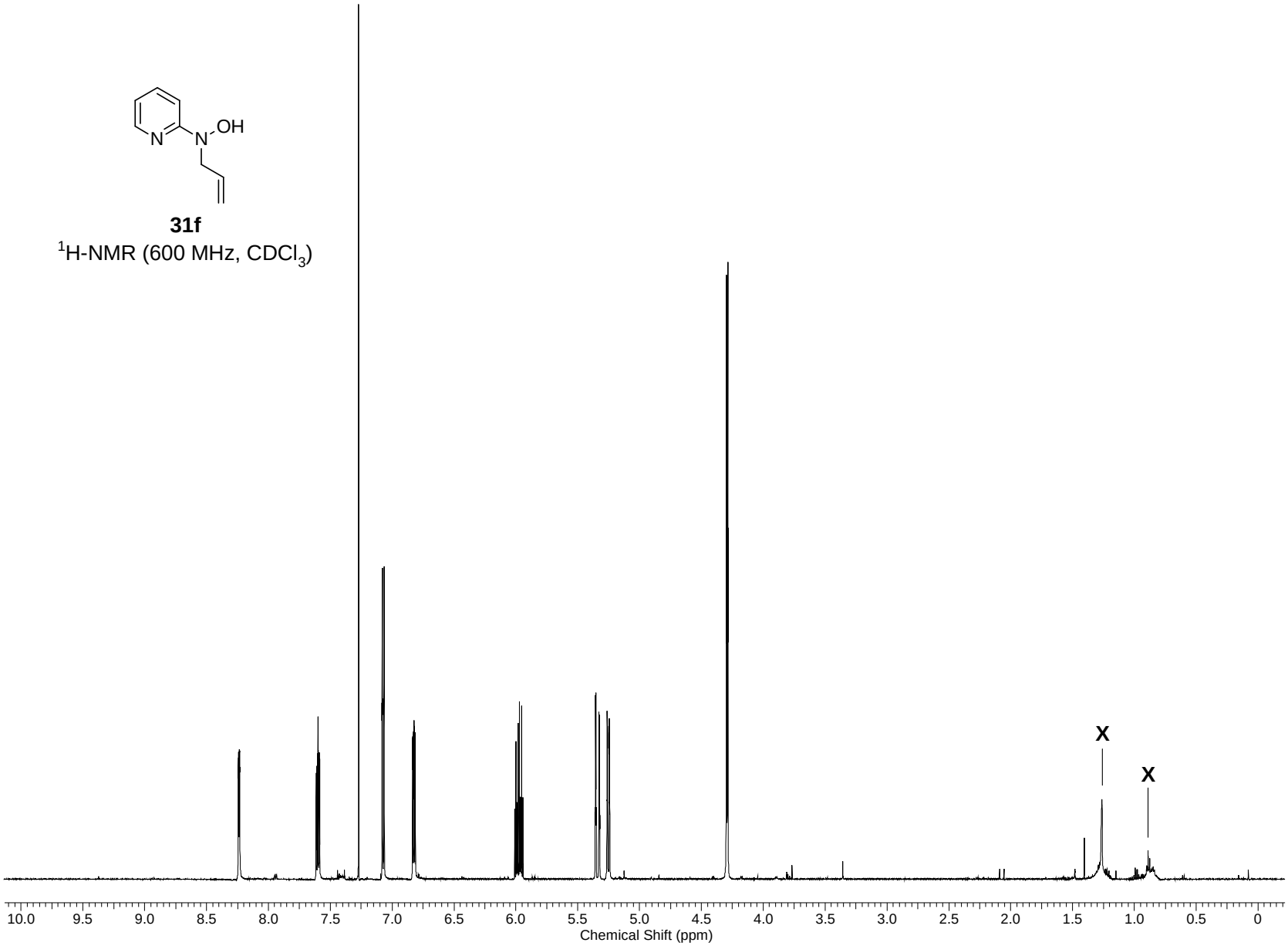
31e

^{1}H-NMR (600 MHz, $CDCl_3$)



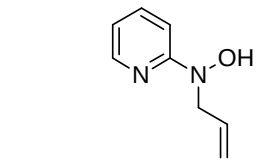
31e

^{13}C-NMR (150 MHz, $CDCl_3$)



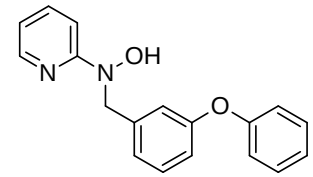
31f

^{1}H-NMR (600 MHz, $CDCl_3$)



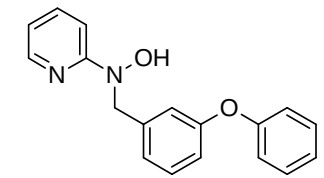
31f

^{13}C-NMR (150 MHz, $CDCl_3$)



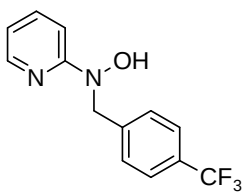
31g

^{1}H-NMR (600 MHz, $CDCl_3$)



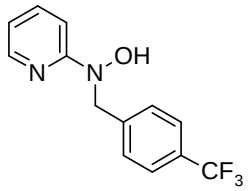
31g

^{13}C-NMR (150 MHz, $CDCl_3$)



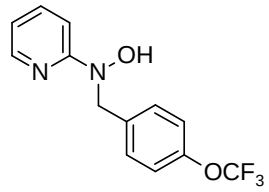
31h

^{1}H-NMR (600 MHz, $CDCl_3$)



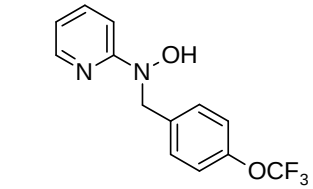
31h

^{13}C-NMR (150 MHz, $CDCl_3$)



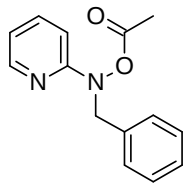
31i

^{1}H-NMR (500 MHz, $CDCl_3$)



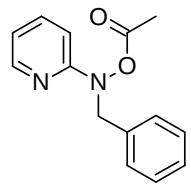
31i

^{13}C-NMR (125 MHz, $CDCl_3$)



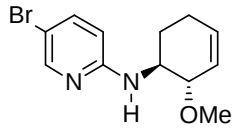
33

^{1}H-NMR (300 MHz, $CDCl_3$)



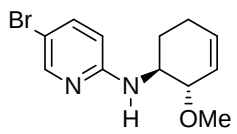
33

^{13}C-NMR (75 MHz, $CDCl_3$)



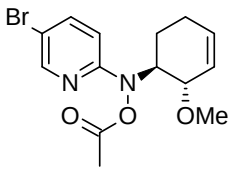
(±) **34**

^{1}H-NMR (600 MHz, DMSO-d_6)



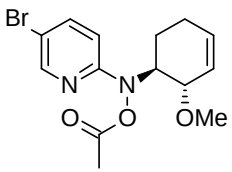
(±) **34**

^{13}C-NMR (150 MHz, DMSO-d_6)



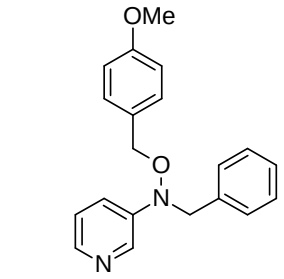
(±) **35**

^{1}H-NMR (600 MHz, $CDCl_3$)



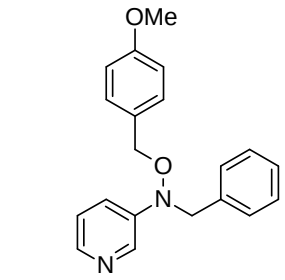
(±) **35**

^{13}C-NMR (150 MHz, $CDCl_3$)



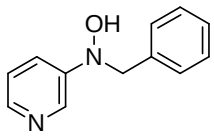
36

^{1}H-NMR (600 MHz, $CDCl_3$)



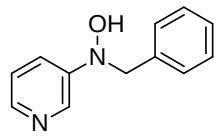
36

^{13}C-NMR (150 MHz, $CDCl_3$)



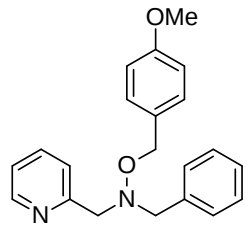
37

^{1}H-NMR (600 MHz, $CDCl_3$)



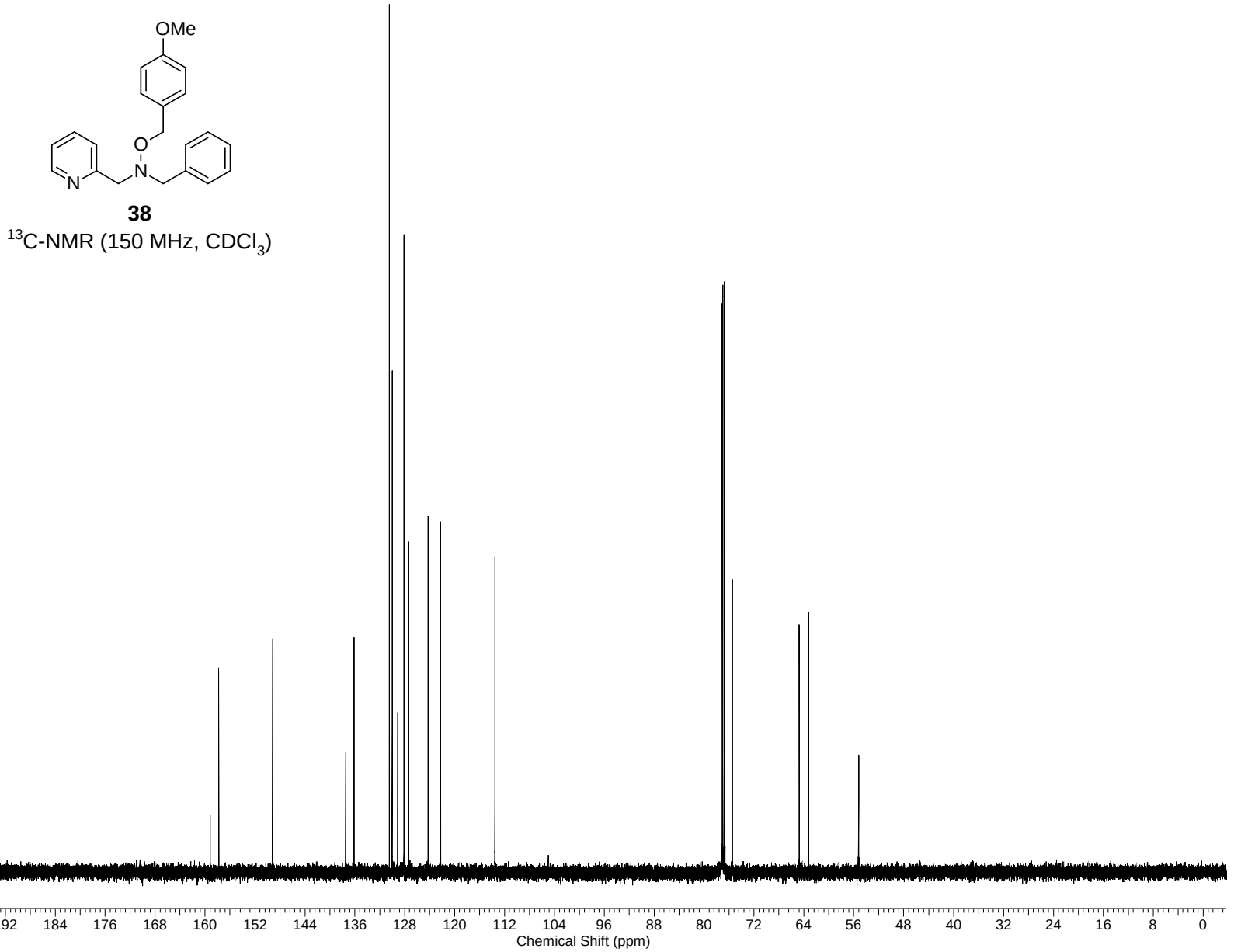
37

^{13}C-NMR (150 MHz, $CDCl_3$)



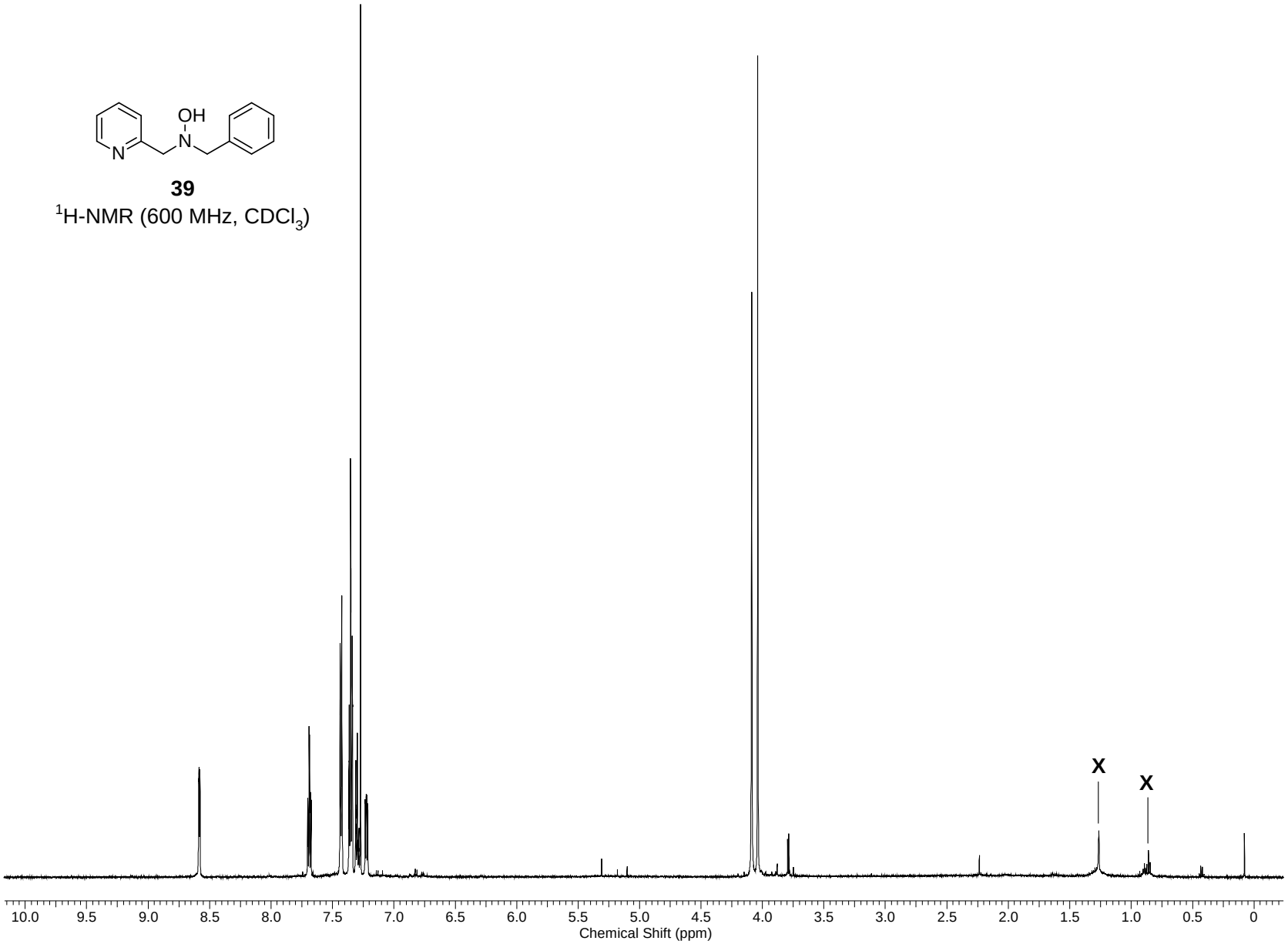
38

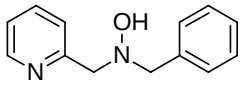
^{1}H-NMR (600 MHz, $CDCl_3$)



38

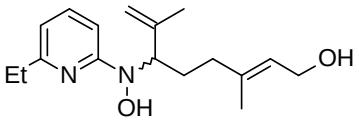
^{13}C-NMR (150 MHz, $CDCl_3$)


OH
N
N
39
1H-NMR (600 MHz, CDCl3)
X
X
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
Chemical Shift (ppm)



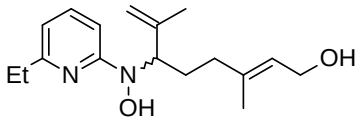
39

^{13}C-NMR (150 MHz, $CDCl_3$)



(±) **40a**

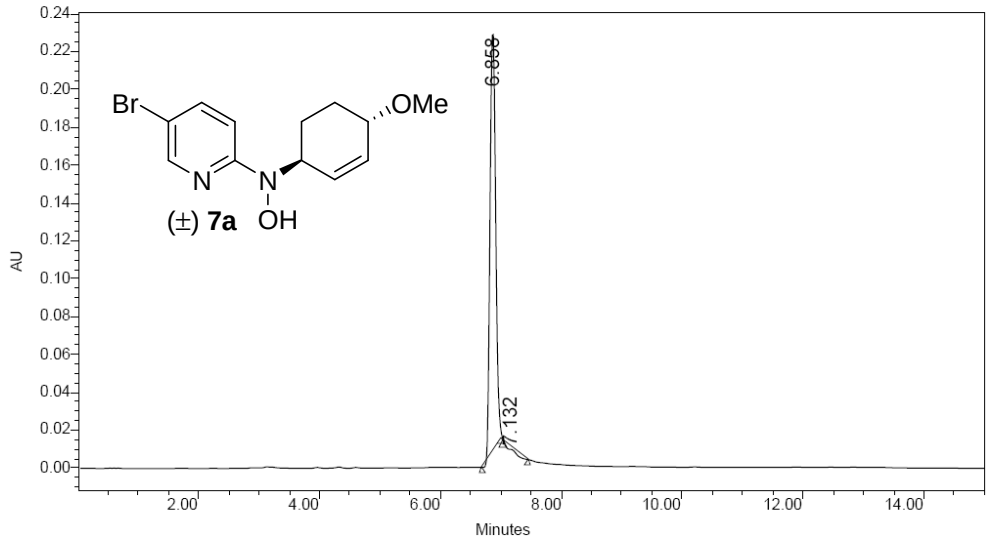
^{1}H-NMR (600 MHz, $CDCl_3$)

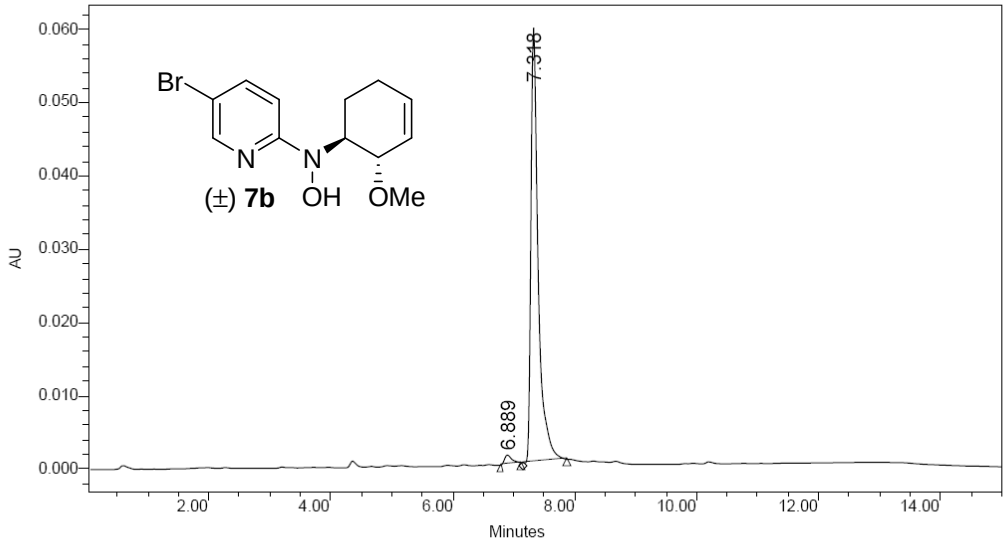


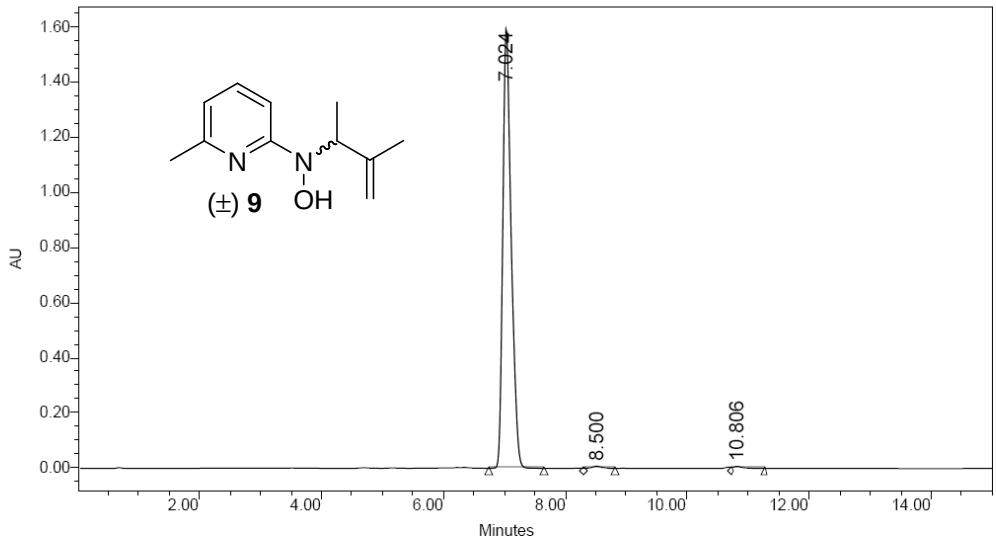
(±) **40a**

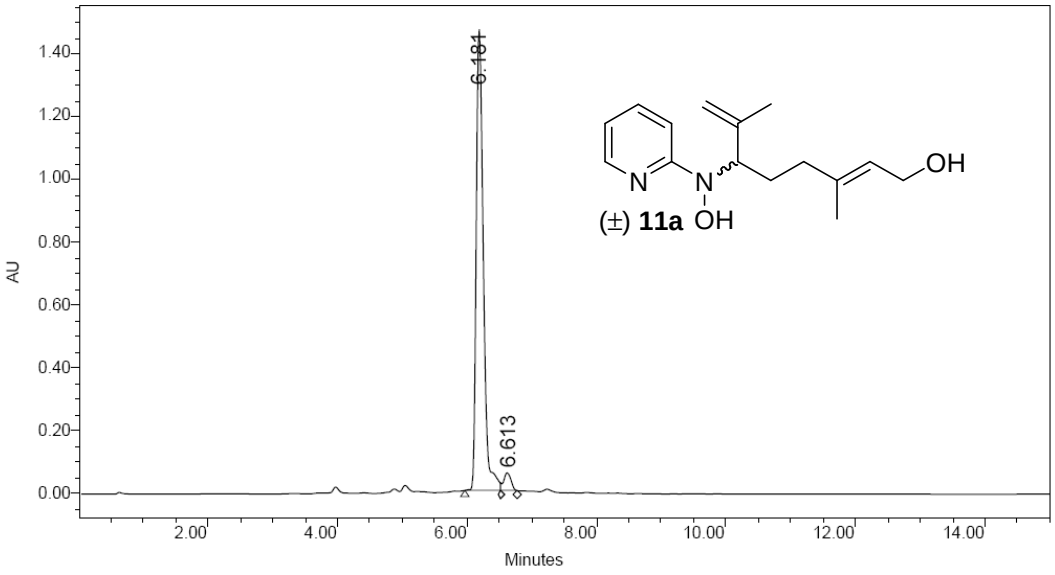
^{13}C-NMR (150 MHz, $CDCl_3$)

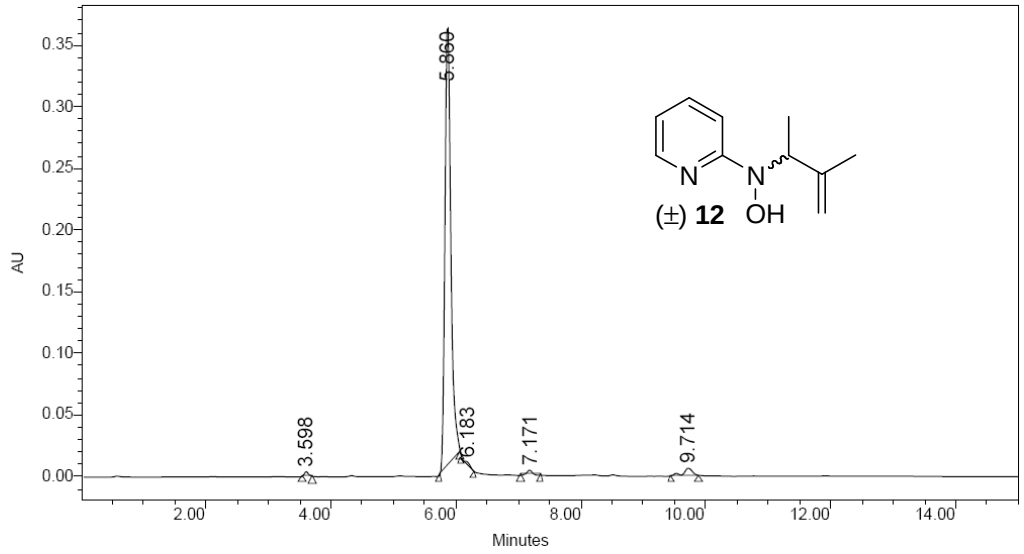
VI. Copies of HPLC Chromatograms

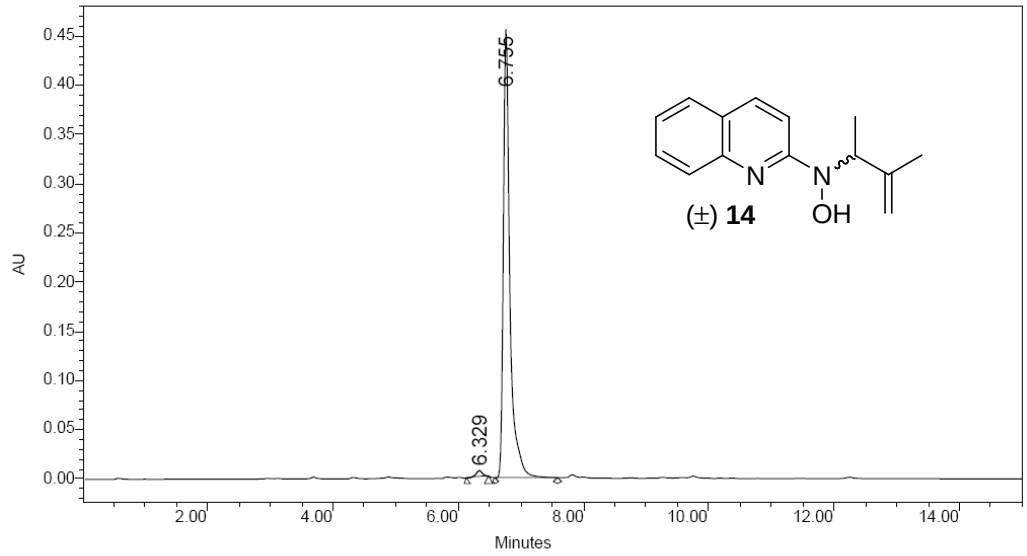


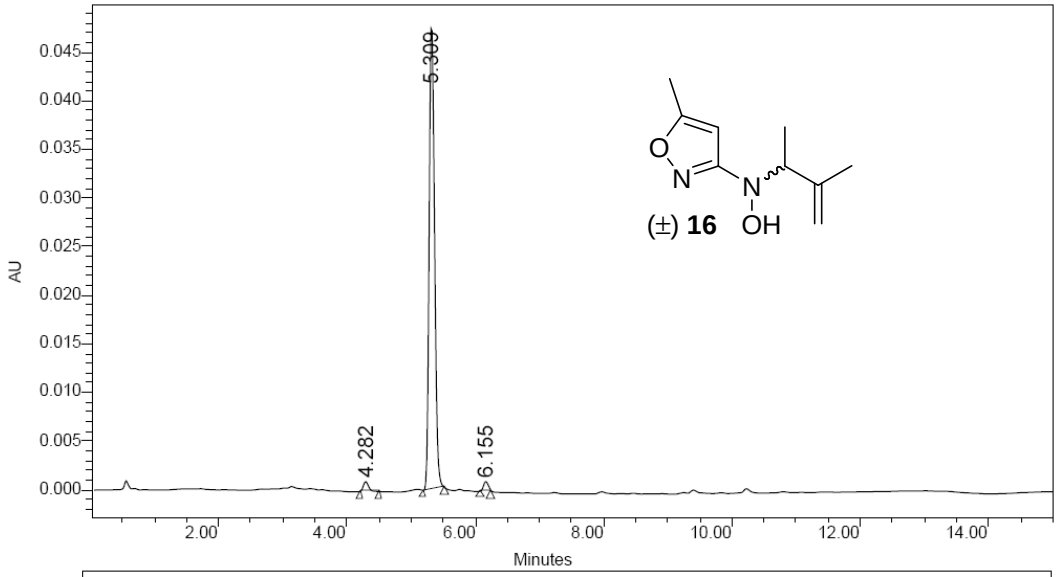


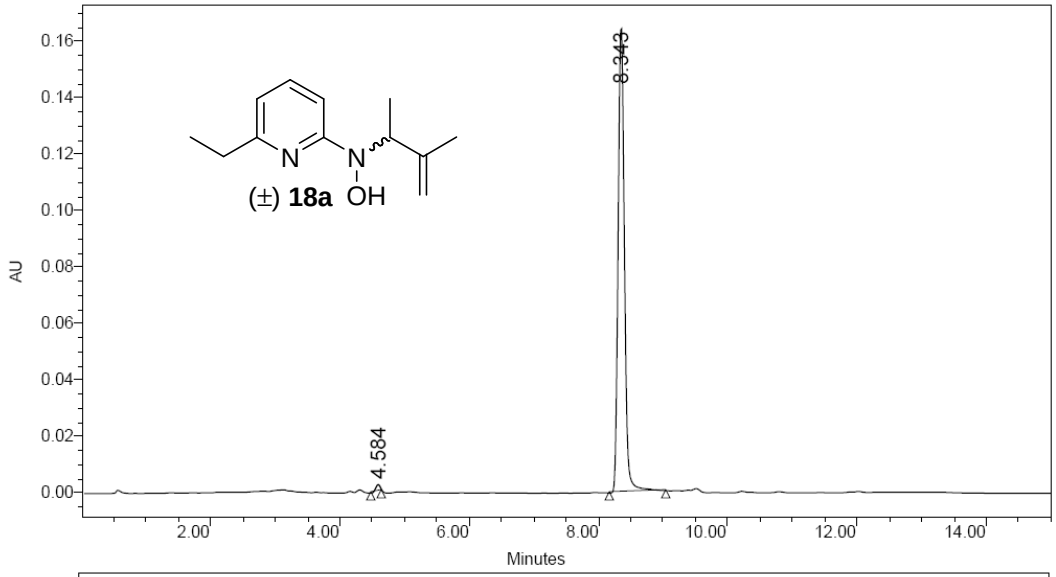


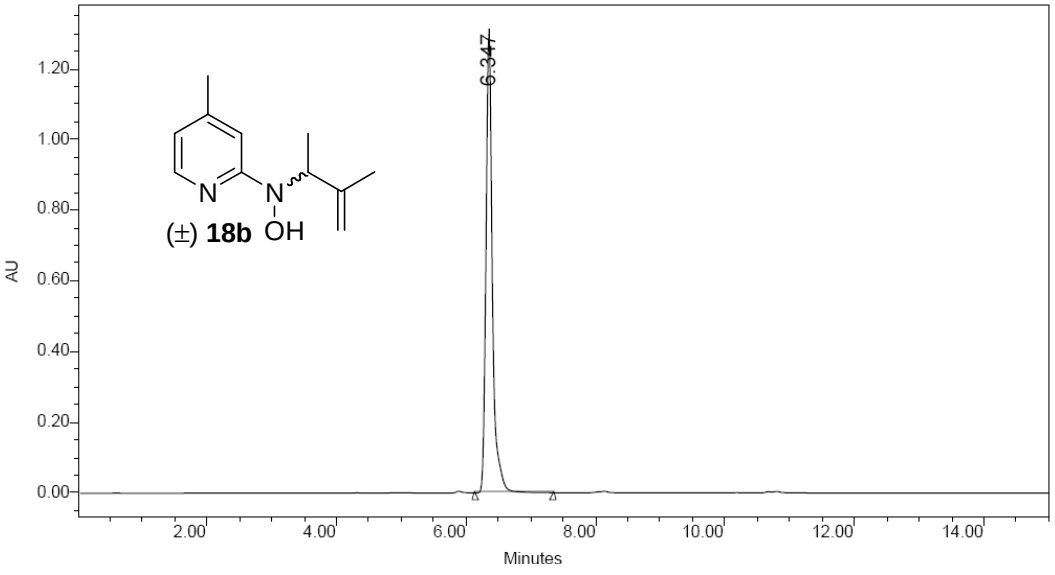

6.181
6.613
AU
Minutes
(±) 11a
OH
N
N
OH

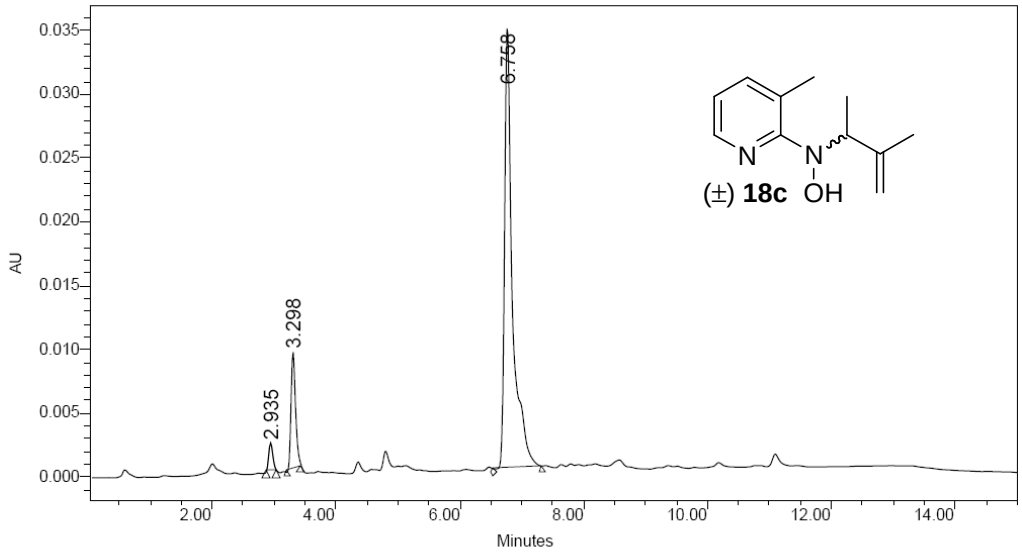

5.860
3.598
6.183
7.171
9.714
AU
Minutes
(±) 12
N
N
OH

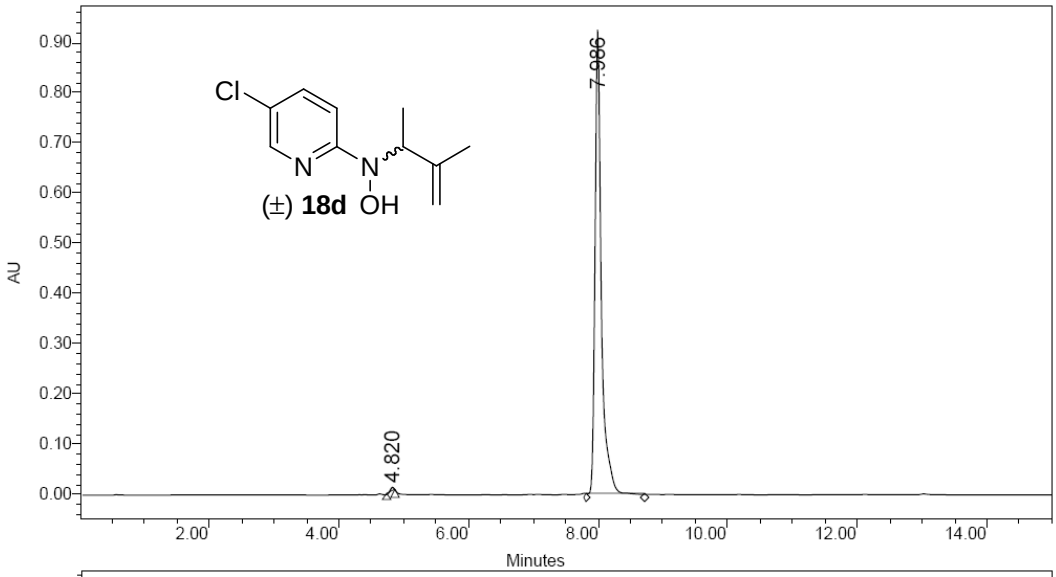

6.755
6.329
AU
Minutes
(±) 14
N
N
OH

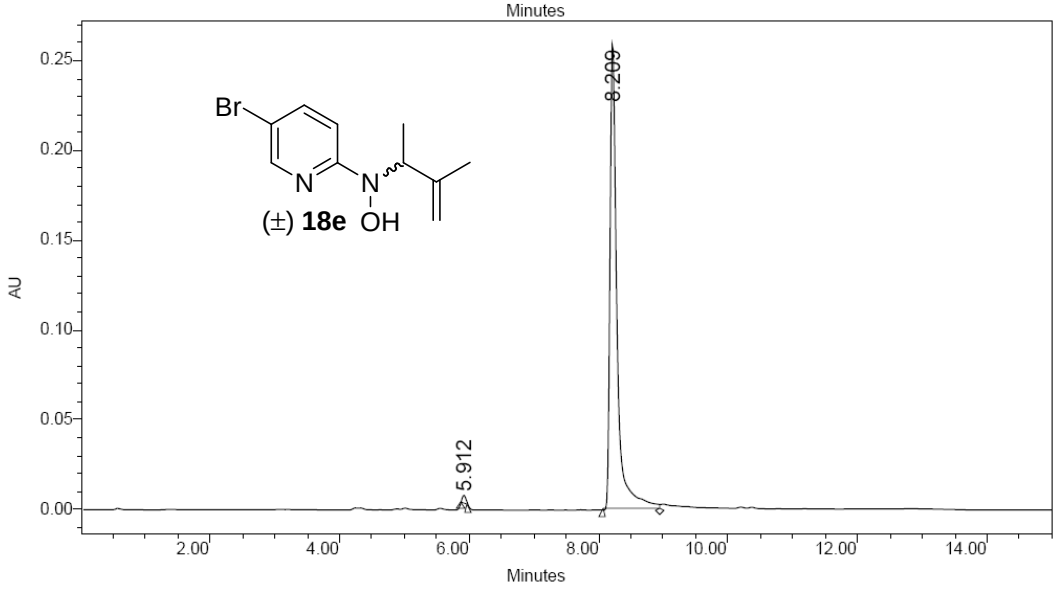

5.309
4.282
6.155
AU
Minutes
(±) 16

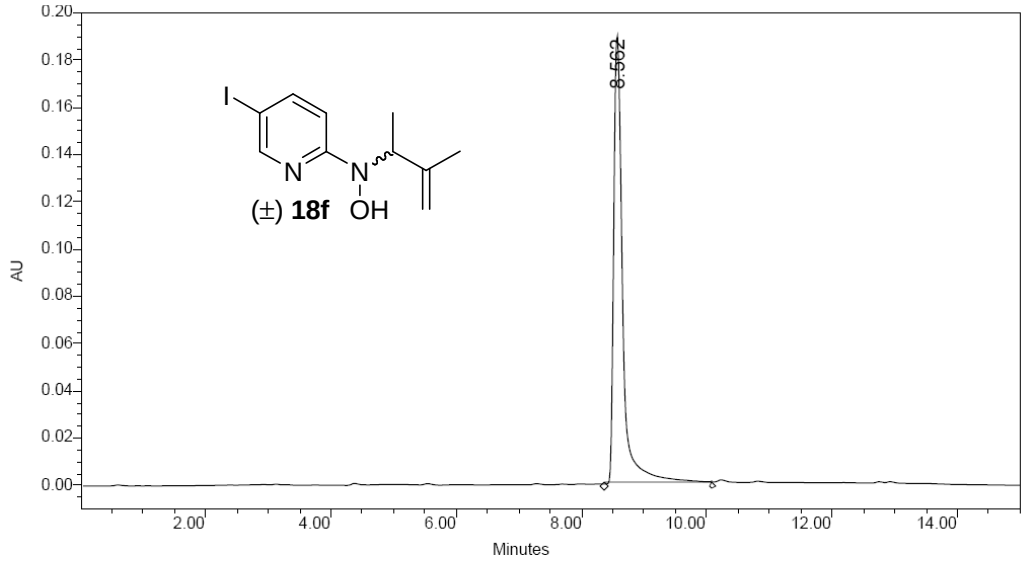

8.343
4.584
AU
Minutes
(±) 18a

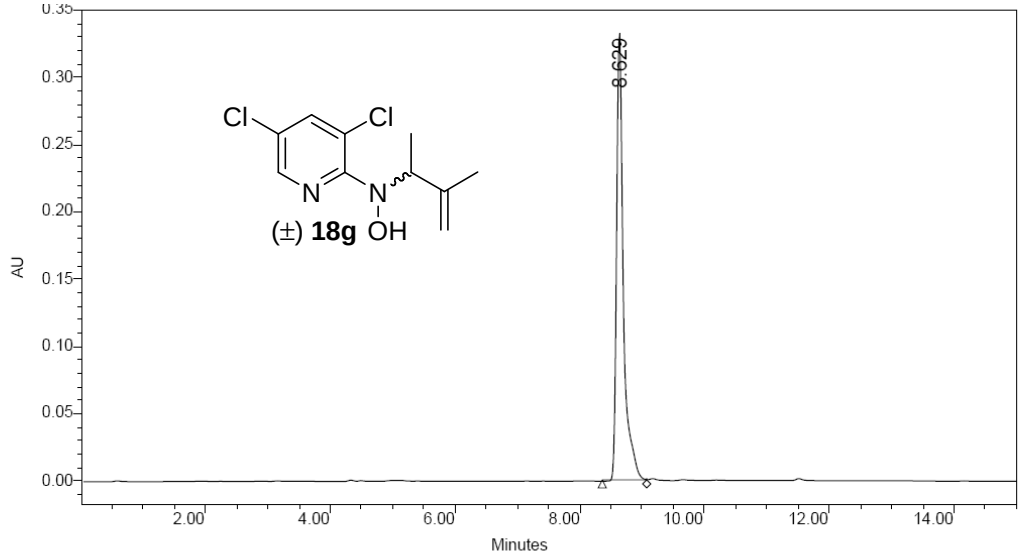

6.347
AU
Minutes
(±) 18b

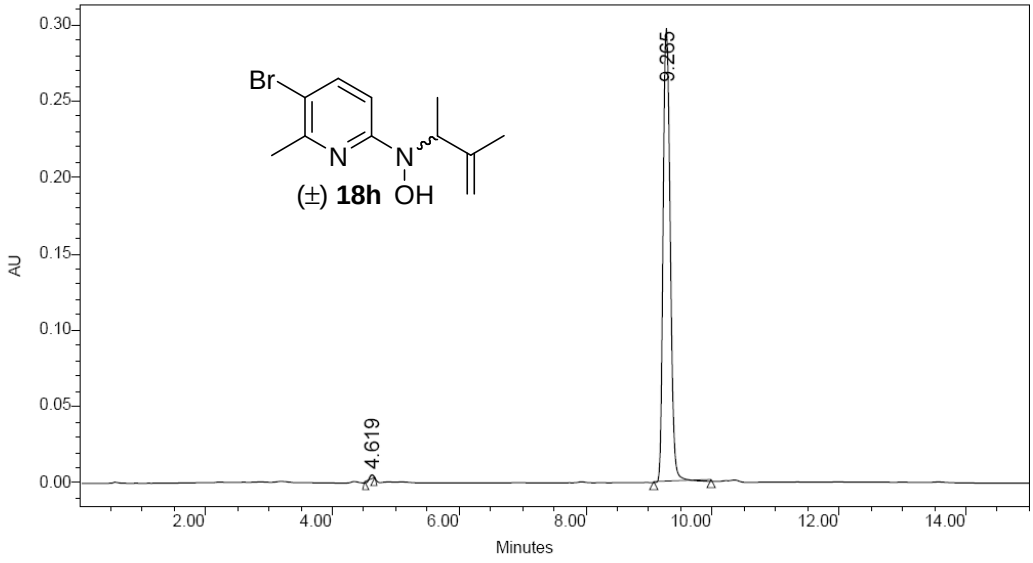

AU
Minutes
2.935
3.298
6.758
(±) 18c

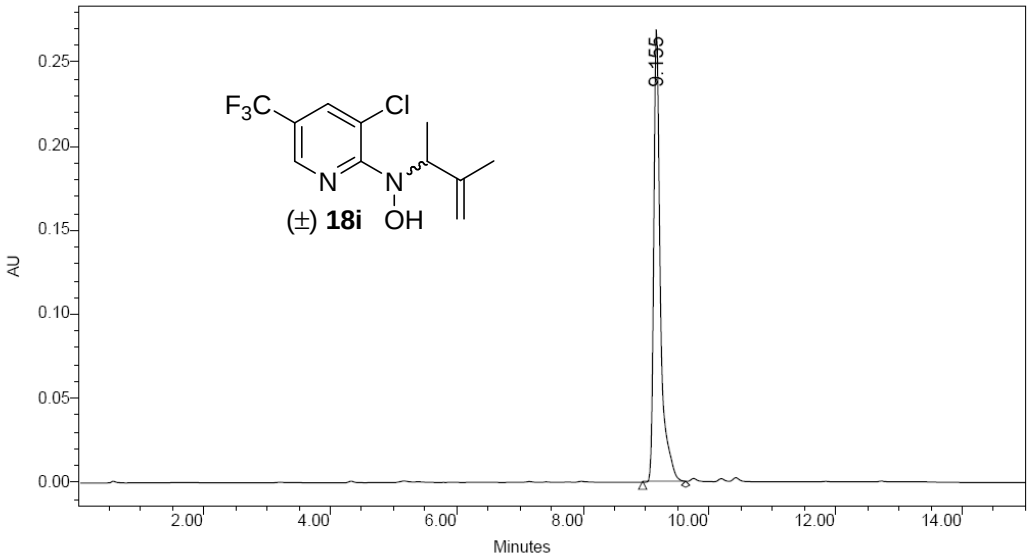

AU
Minutes
4.820
7.986
Cl
(±) 18d

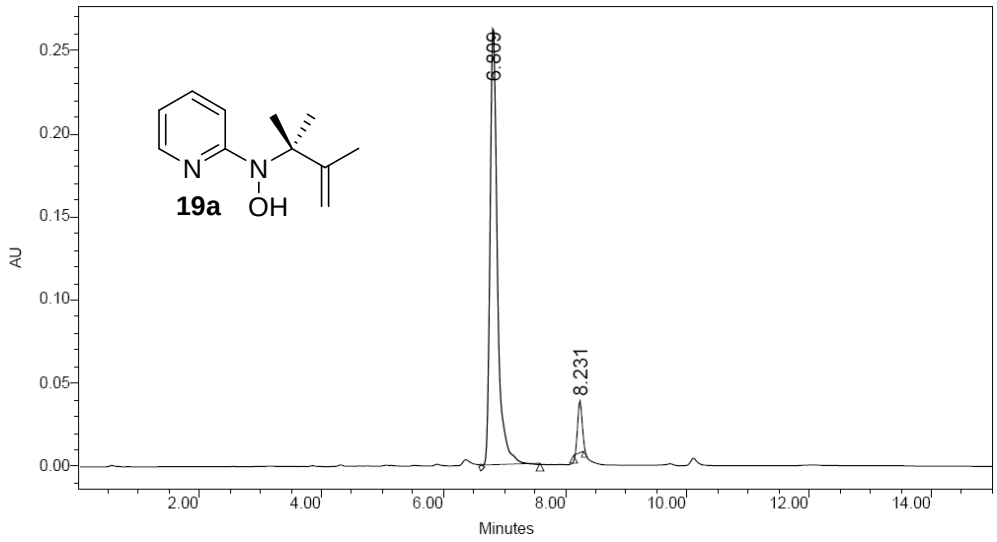

AU
Minutes
5.912
8.209
Br
(±) 18e

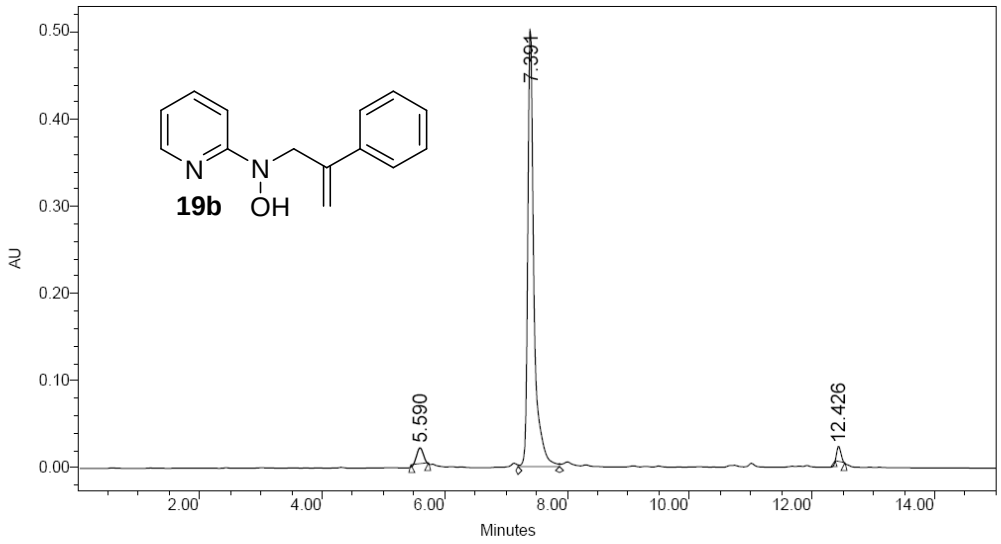

I
N
N
OH
(±) 18f
8.562
AU
Minutes

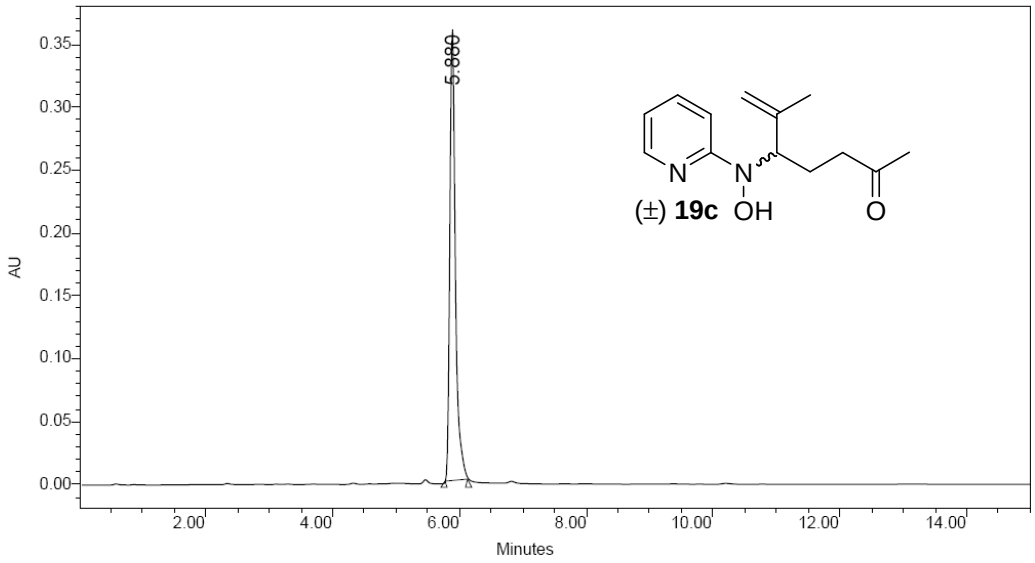

Cl
Cl
N
N
OH
(±) 18g
8.629
AU
Minutes

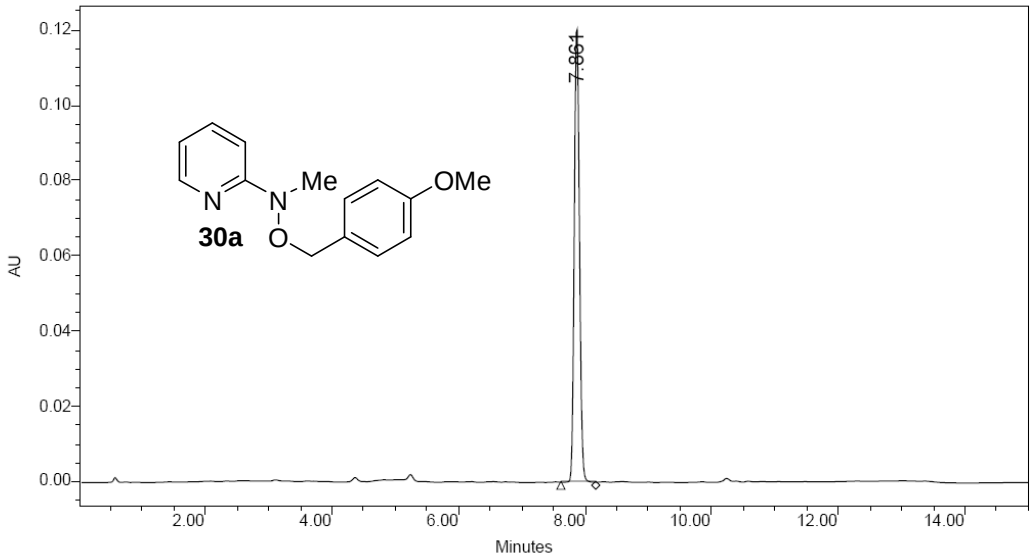

Br
N
N
OH
(±) 18h
9.265
4.619
AU
Minutes

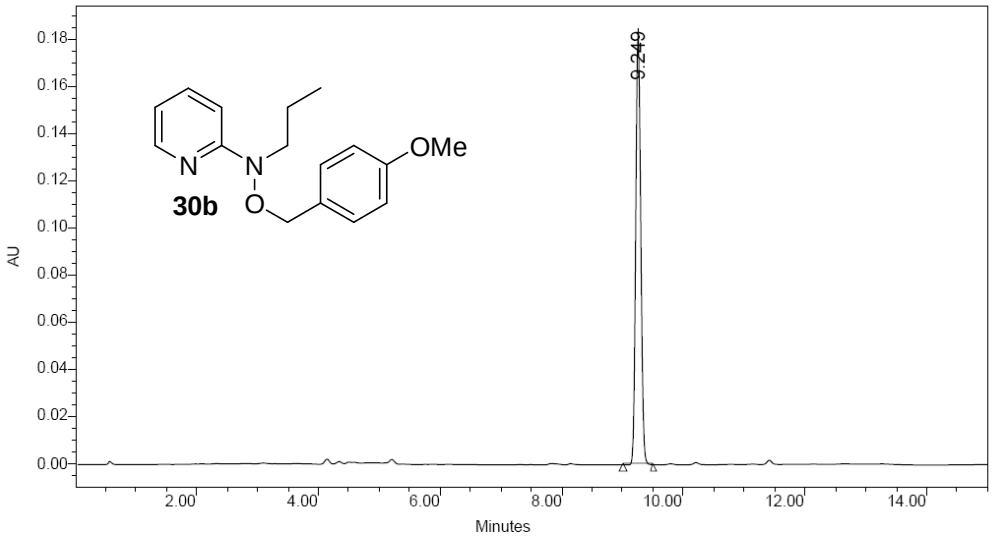

F3C
Cl
N
N
OH
(±) 18i
9.155
AU
0.25
0.20
0.15
0.10
0.05
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
Minutes

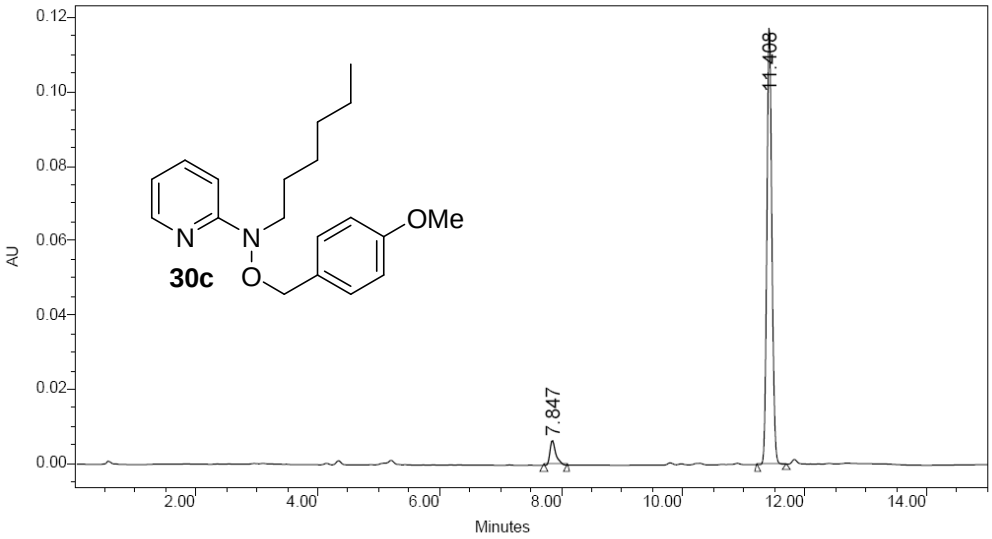

N
N
OH
19a
6.809
8.231
AU
0.25
0.20
0.15
0.10
0.05
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
Minutes

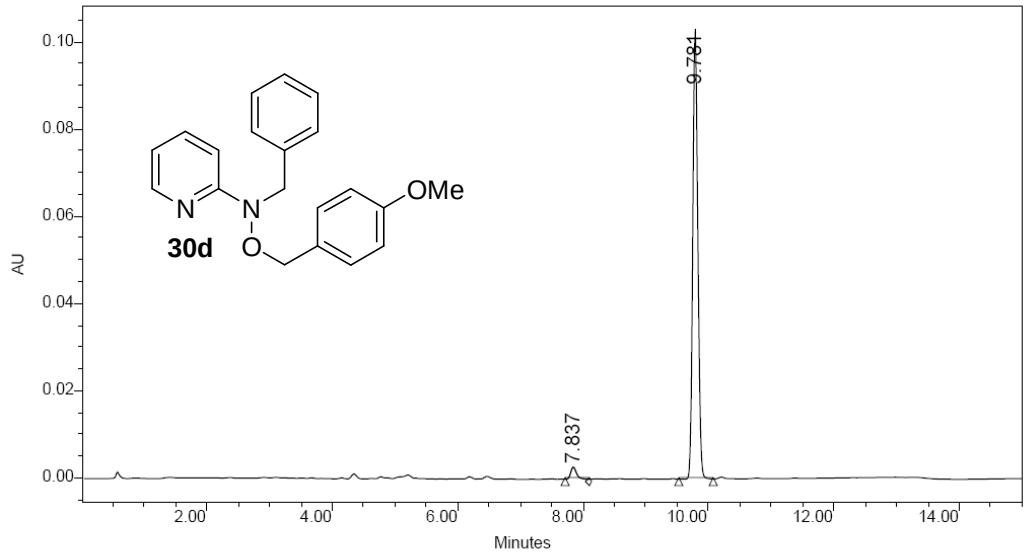

N
N
OH
19b
7.391
5.590
12.426
AU
0.50
0.40
0.30
0.20
0.10
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
Minutes

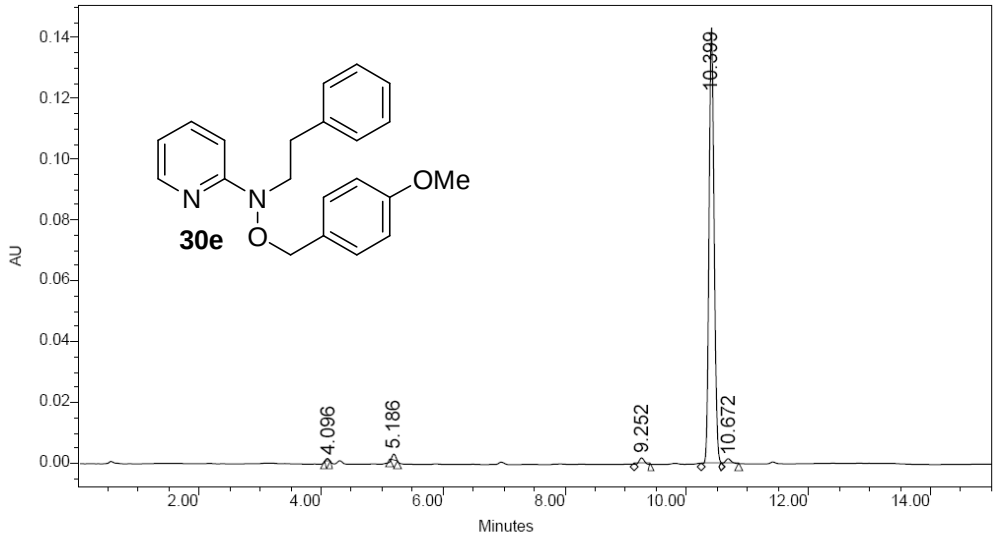

5.880
AU
Minutes
(±) 19c
N
N
OH
O

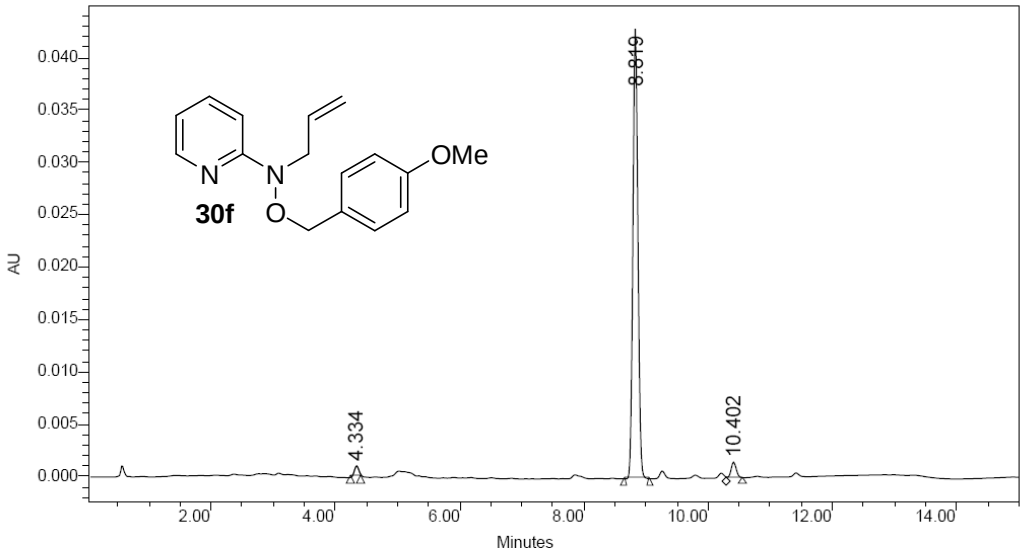

7.061
AU
Minutes
30a
N
N
Me
O
OMe

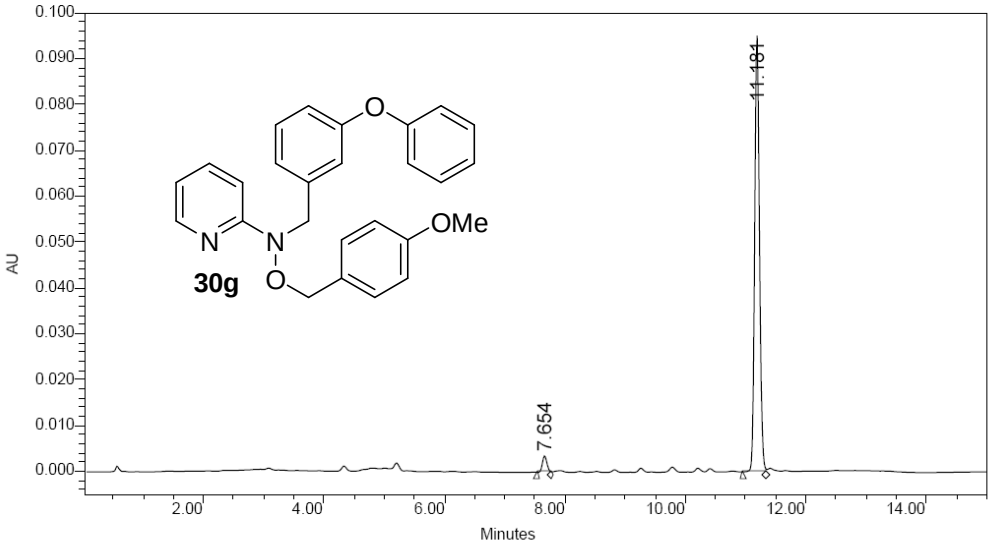

9.249
AU
Minutes
30b
N
N
O
OMe

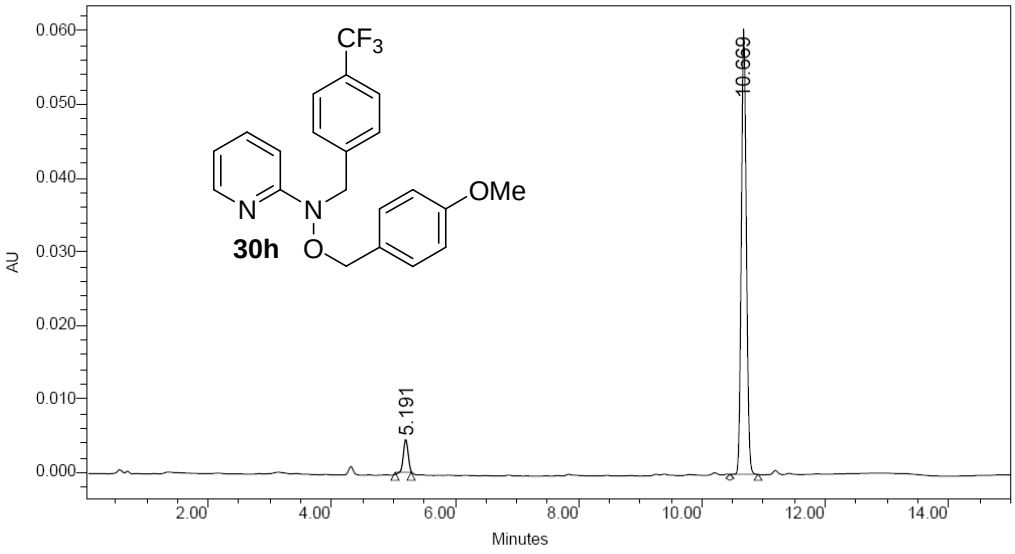

30c
OMe
11.408
7.847
AU
Minutes

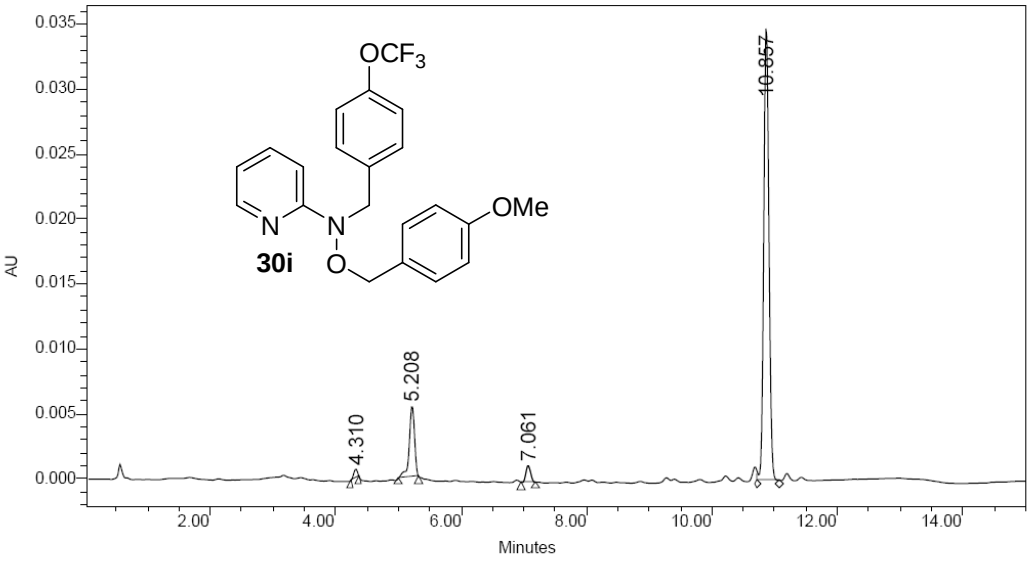

30d
OMe
9.781
7.837
AU
Minutes

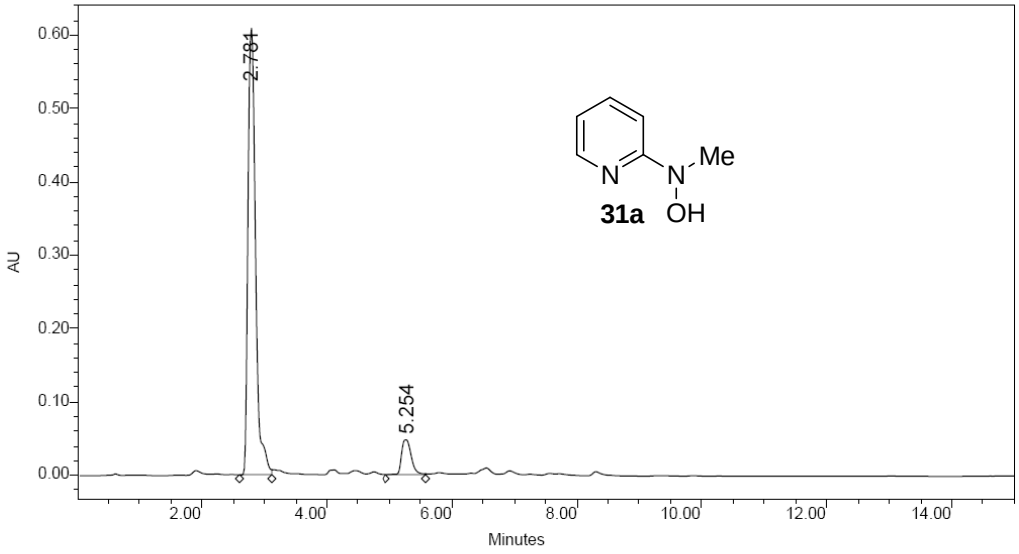

30e
OMe
10.399
4.096
5.186
9.252
10.672
AU
Minutes

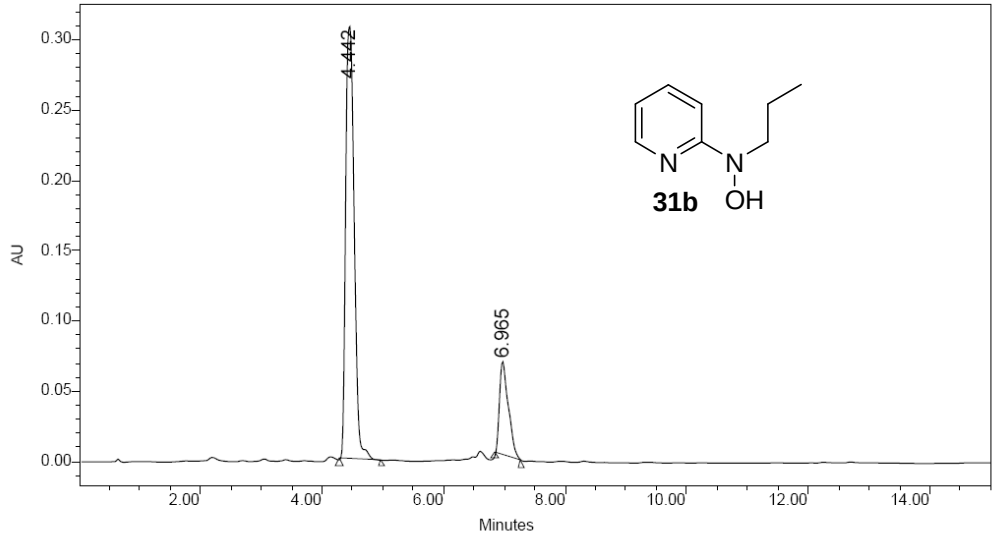

30f
OMe
8.819
4.334
10.402
AU
Minutes

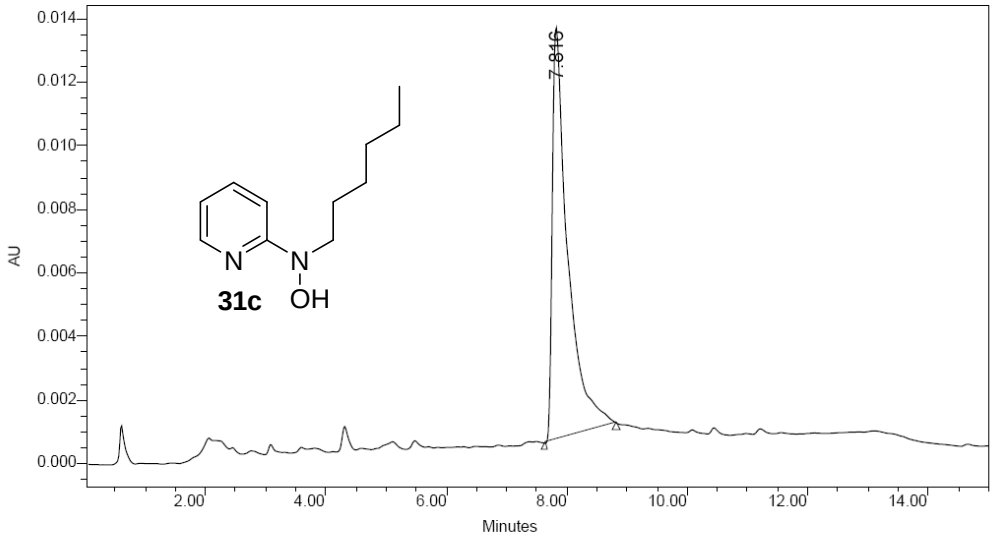

30g
OMe
11.181
7.654
AU
Minutes

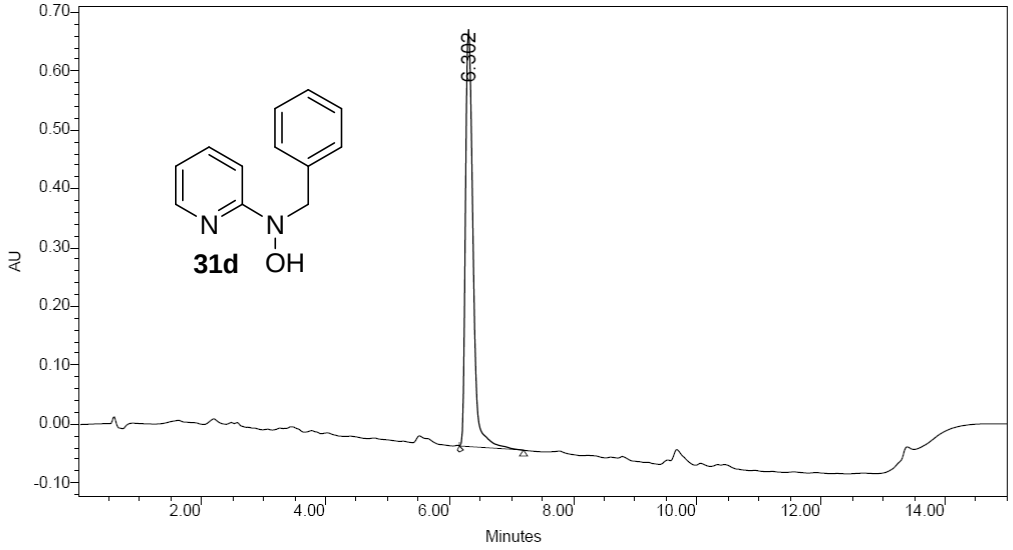

30h
CF3
OMe
10.669
5.191
AU
Minutes

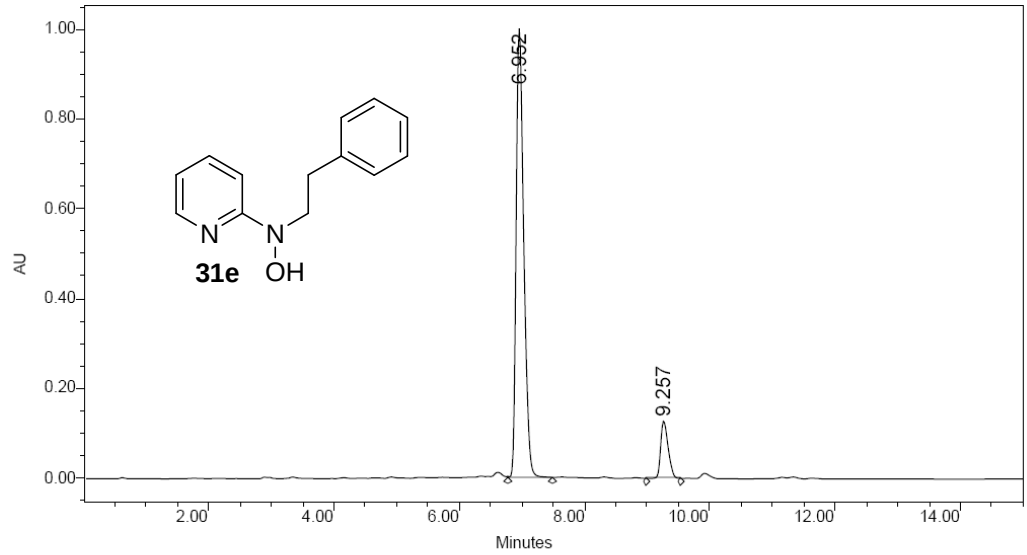

OCF3
OMe
N
N
O
30i
10.057
5.208
4.310
7.061
AU
Minutes

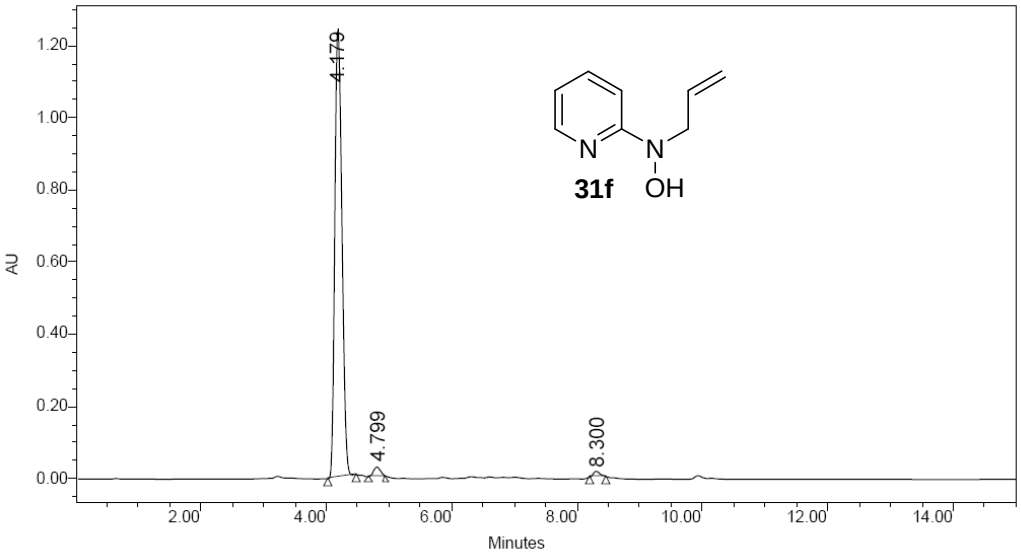

2.784
5.254
Me
N
N
OH
31a
AU
Minutes

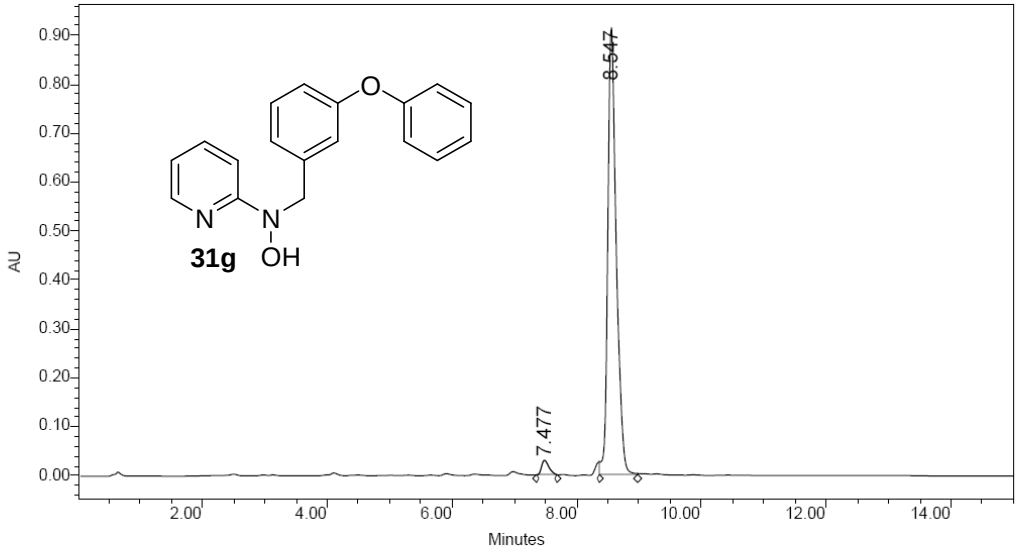

4.442
6.965
N
N
OH
31b
AU
Minutes


7.816
AU
Minutes
31c
N
N
OH


6.302
AU
Minutes
31d
N
N
OH


6.952
9.257
AU
Minutes
31e
N
N
OH


4.179
4.799
8.300
AU
Minutes
31f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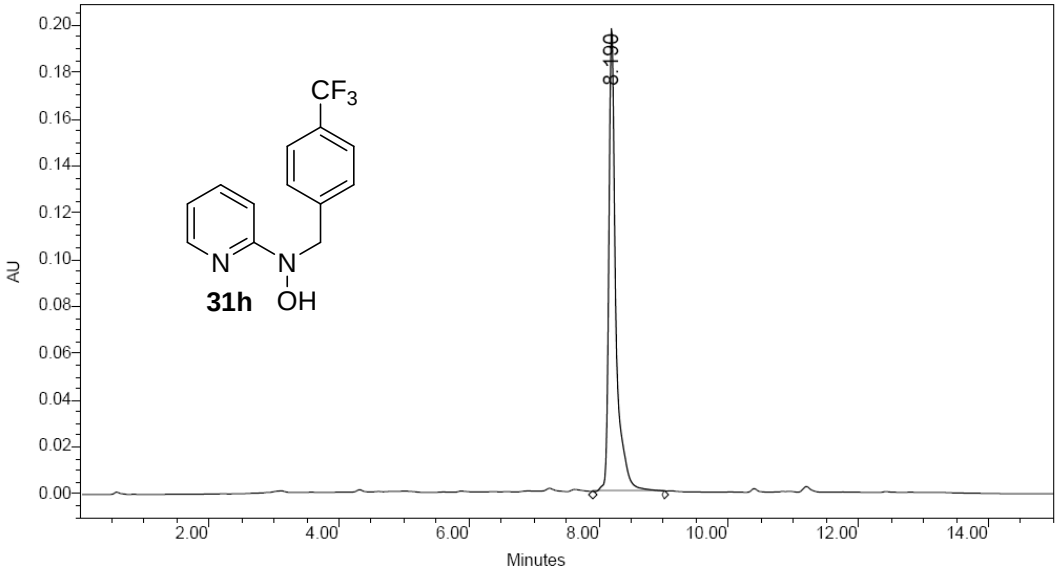
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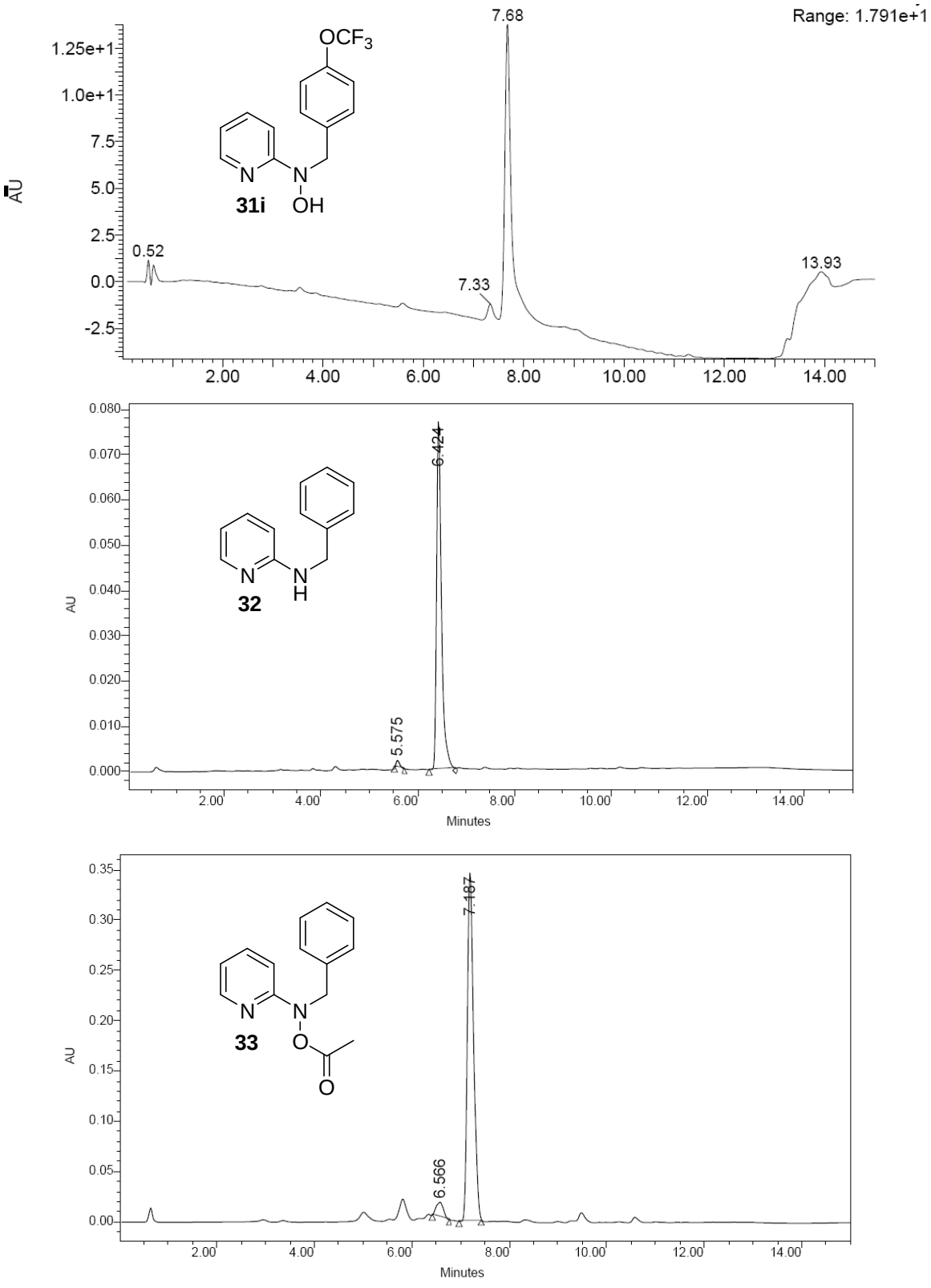
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4.00
6.00
8.00
10.00
12.00
14.00
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0.070
0.060
0.050
0.040
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0.020
0.010
0.000
6.424
32
5.575
Minutes
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0.10
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0.00
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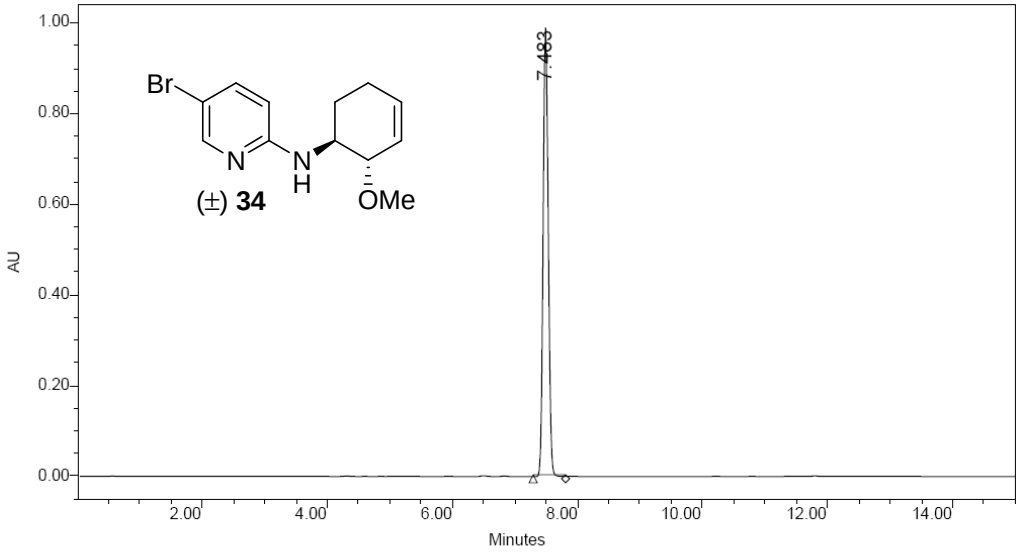
O
6.566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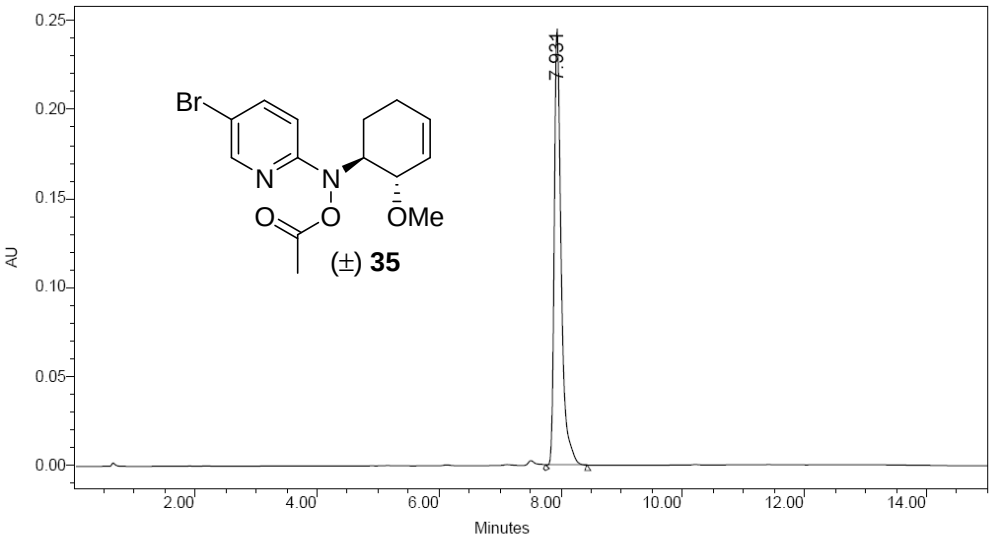
Minutes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4.00
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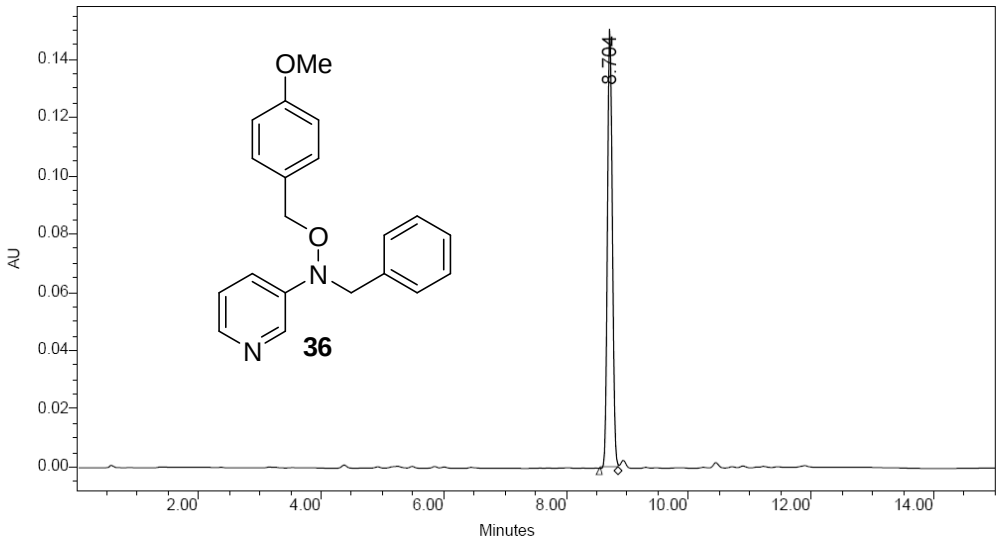
8.00
10.00
12.00
14.00
Minutes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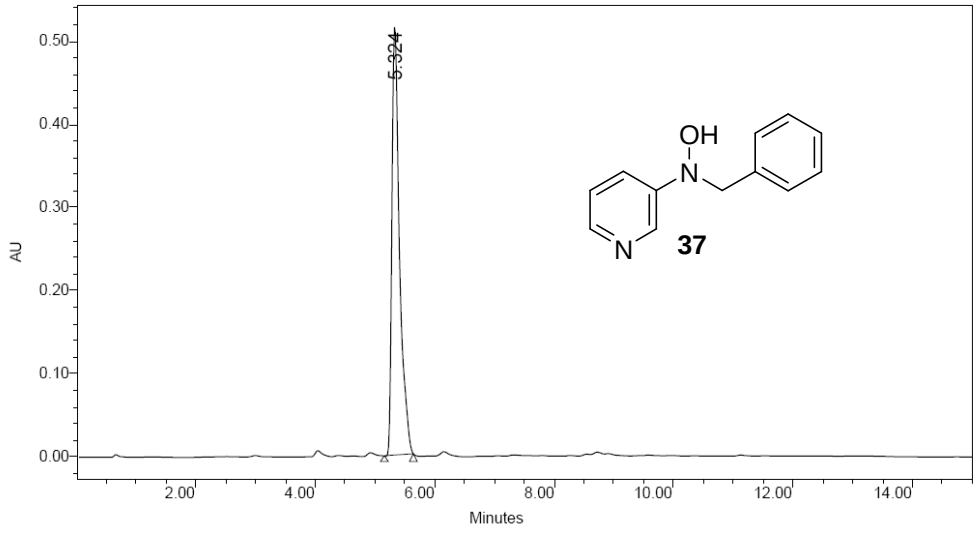
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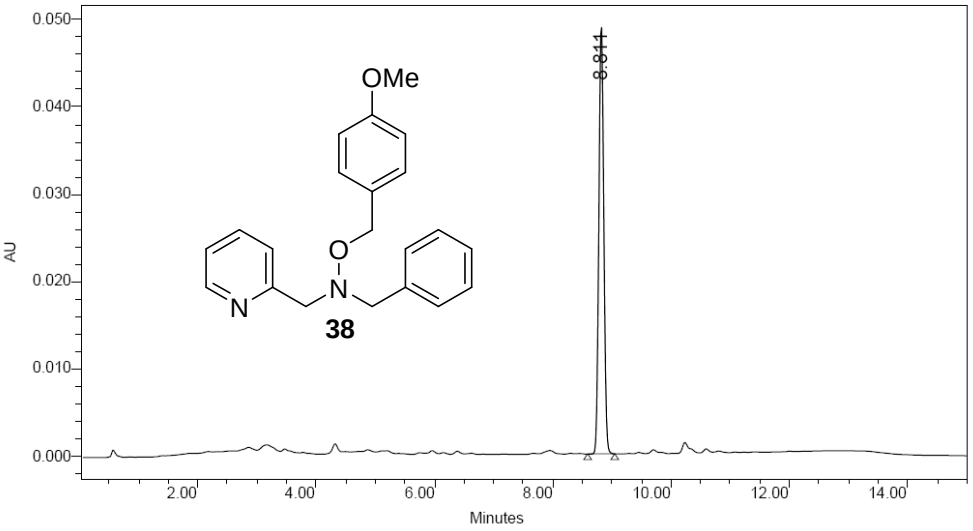
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8.00
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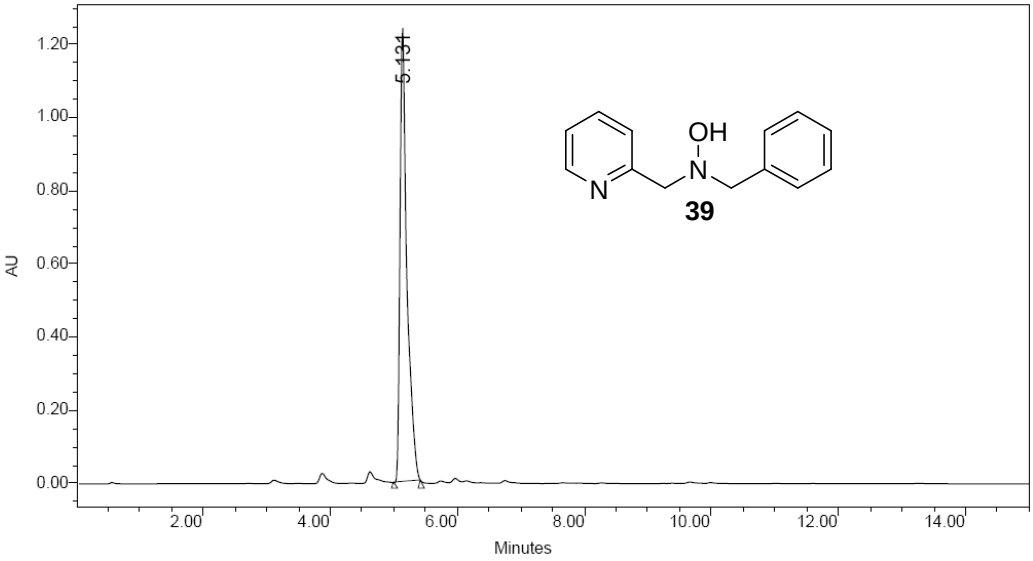
14.00
Minutes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8.00
10.00
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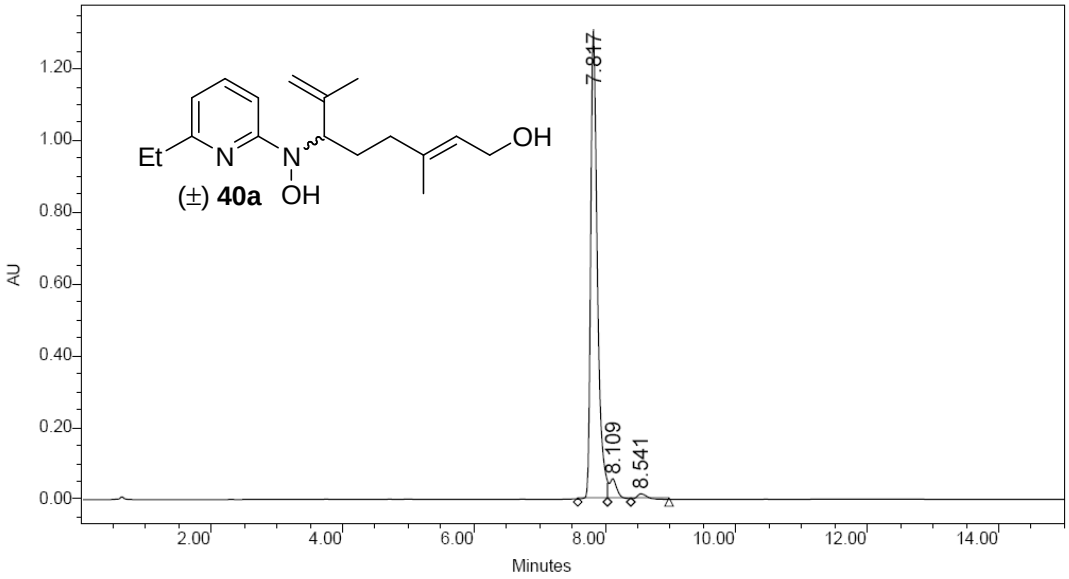
14.00
Minutes



VII. X-ray Diffraction Data for Compound 40a

Discussion

Compound **40a** crystallizes as colorless block-like crystals from a dichloromethane/hexanes solution. There are two molecules of the compound in the unit cell of the primitive, centrosymmetric space group P-1.

The structure of compound **40a** is as expected (see **Figures 4**, **S1**, and **S2**). Due to the center of symmetry present in the lattice, the compound is a racemate. The C12-C13 bond distance clearly shows the presence of a vinyl group (C12-C13 = 1.323(2) Å). The hydroxyl, O2, forms an H-bond to the pyridyl nitrogen of a neighboring molecule related by inversion symmetry, which in turn also donates an H-bond from the its hydroxyl O2' back to the pyridine nitrogen N2. These H-bonded dimers are then linked in chains along the crystallographic a-axis by hydrogen bonds from the hydroxyl O1, to the hydroxyl oxygen O2" of a neighboring H-bonded dimer (see **Table S10** for details of Hydrogen-bonds).

The bond distances and angles within the molecule are as expected. Data were collected at the slightly elevated (with respect to routine experiments) temperature of 200 K. Below this temperature the crystals were observed to undergo a phase transition resulting in the crystal shattering.

Crystal Summary

Crystal data for $C_{17}H_{26}N_2O_2$; M_r = 290.40; Triclinic; space group P-1; a = 8.7695(3) Å; b = 9.2936(3) Å; c = 11.3422(4) Å; α = 102.466(2)°; β = 108.736(2)°; γ = 94.007(2)°; V = 845.03(5)

$Å^3$; Z = 2; T = 200(2) K; λ(Mo-Kα) = 0.71073 Å; μ(Mo-Kα) = 0.075 mm^{-1}; d_{calc} = 1.141$g.cm^{-3}$; 11449 reflections collected; 3470 unique (R_{int} = 0.0208); giving R_1 = 0.0435, wR_2 = 0.1137 for 2827 data with [I>2σ(I)] and R_1 = 0.0536, wR_2 = 0.1217 for all 3470 data. Residual electron density ($e^-.Å^{-3}$) max/min: 0.215/-0.211.

An arbitrary sphere of data were collected on a colorless block-like crystal, having approximate dimensions of 0.65 × 0.21 × 0.17 mm, on a Bruker APEX-II diffractometer using a combination of ω- and φ-scans of 0.5°. Data were corrected for absorption and polarization effects and analyzed for space group determination. The structure was solved by direct methods and expanded routinely. The model was refined by full-matrix least-squares analysis of F^2 against all reflections. All non-hydrogen atoms were refined with anisotropic thermal displacement parameters. Unless otherwise noted, hydrogen atoms were included in calculated positions. Thermal parameters for the hydrogens were tied to the isotropic thermal parameter of the atom to which they are bonded (1.5 × for methyl, 1.2 × for all others).

Table S4. Crystal data and structure refinement for compound **40a**.

Identification code	nd1105	
Empirical formula	$C_{17}H_{26}N_2O_2$	
Formula weight	290.40	
Temperature	200(2) K	
Wavelength	0.71073 Å	
Crystal system	Triclinic	
Space group	P-1	
Unit cell dimensions	*a* = 8.7695(3) Å	α = 102.466(2)°
	b = 9.2936(3) Å	β = 108.736(2)°
	c = 11.3422(4) Å	γ = 94.007(2)°
Volume	845.03(5) $Å^3$	
Z	2	
Density (calculated)	1.141 $g.cm^{-3}$	
Absorption coefficient (μ)	0.075 mm^{-1}	
F(000)	316	
Crystal size	0.65 × 0.21 × 0.17 mm^3	
θ range for data collection	1.96 to 26.59°	
Index ranges	$-10 \le h \le 10$, $-11 \le k \le 11$, $-14 \le l \le 14$	
Reflections collected	11449	
Independent reflections	3470 [R_{int} = 0.0208]	
Completeness to θ = 26.59°	98.2 %	
Absorption correction	numerical	
Max. and min. transmission	1.0000 and 0.9331	
Refinement method	Full-matrix least-squares on F^2	
Data / restraints / parameters	3470 / 0 / 195	

Goodness-of-fit on F^2	1.049
Final R indices [I>2σ(I)]	R_1 = 0.0435, wR_2 = 0.1137
R indices (all data)	R_1 = 0.0536, wR_2 = 0.1217
Largest diff. peak and hole	0.215 and -0.211 $e^-.Å^{-3}$

Table S5. Atomic coordinates and equivalent isotropic displacement parameters ($Å^2$) for compound **40a**. U(eq) is defined as one third of the trace of the orthogonalized U_{ij} tensor.

	x	y	z	U(eq)
O(1)	-0.09777(12)	0.23473(11)	0.07017(10)	0.042(1)
O(2)	0.75090(12)	0.25282(12)	-0.17294(10)	0.043(1)
N(1)	0.05824(14)	0.59512(13)	0.28262(12)	0.038(1)
N(2)	0.00483(13)	0.37548(13)	0.12322(11)	0.035(1)
C(1)	0.0204(2)	0.68794(17)	0.37525(16)	0.045(1)
C(2)	-0.1116(2)	0.6493(2)	0.40998(18)	0.056(1)
C(3)	-0.2080(2)	0.5137(2)	0.34641(18)	0.056(1)
C(4)	-0.17262(18)	0.41800(18)	0.25154(16)	0.045(1)
C(5)	-0.03591(16)	0.46268(15)	0.22275(13)	0.034(1)
C(6)	0.17771(15)	0.35521(15)	0.15008(13)	0.032(1)
C(7)	0.20254(16)	0.28388(17)	0.02437(13)	0.037(1)
C(8)	0.38128(17)	0.26653(17)	0.04643(14)	0.039(1)
C(9)	0.41666(17)	0.21052(16)	-0.07533(14)	0.038(1)
C(10)	0.52519(17)	0.29203(16)	-0.10271(14)	0.039(1)
C(11)	0.57923(18)	0.25562(18)	-0.21617(15)	0.044(1)
C(12)	0.23965(17)	0.27593(18)	0.25557(14)	0.041(1)
C(13)	0.3420(2)	0.3533(2)	0.36914(16)	0.058(1)
C(14)	0.1825(3)	0.1134(2)	0.2285(2)	0.074(1)
C(15)	0.3237(3)	0.0616(2)	-0.1574(2)	0.068(1)
C(16)	0.1288(2)	0.83671(19)	0.43803(19)	0.060(1)
C(17)	0.3019(3)	0.8237(2)	0.50860(19)	0.068(1)
H(1)	-0.1519	0.2270	-0.0075	0.050
H(2)	0.7950	0.3059	-0.2078	0.051
H(2A)	-0.1350	0.7152	0.4764	0.067
H(3A)	-0.2997	0.4860	0.3683	0.067
H(4A)	-0.2390	0.3243	0.2068	0.054
H(6A)	0.2426	0.4574	0.1822	0.038
H(7A)	0.1671	0.3465	-0.0369	0.045
H(7B)	0.1342	0.1847	-0.0142	0.045
H(8A)	0.4498	0.3643	0.0936	0.047
H(8B)	0.4127	0.1965	0.1016	0.047
H(10A)	0.5744	0.3850	-0.0425	0.047
H(11A)	0.5211	0.1573	-0.2729	0.053
H(11B)	0.5534	0.3315	-0.2660	0.053
H(13A)	0.3815	0.3054	0.4366	0.070
H(13B)	0.3761	0.4568	0.3832	0.070

H(14A)	0.2466	0.0746	0.2997	0.111
H(14B)	0.1962	0.0610	0.1486	0.111
H(14C)	0.0672	0.0977	0.2194	0.111
H(15A)	0.3808	0.0178	-0.2146	0.102
H(15B)	0.2143	0.0741	-0.2090	0.102
H(15C)	0.3153	-0.0043	-0.1024	0.102
H(16A)	0.1266	0.8903	0.3711	0.071
H(16B)	0.0846	0.8970	0.4992	0.071
H(17A)	0.3683	0.9225	0.5393	0.102
H(17B)	0.3439	0.7575	0.4505	0.102
H(17C)	0.3068	0.7826	0.5821	0.102

Table S6. Anisotropic displacement parameters ($Å^2$) for compound **40a**. The anisotropic displacement factor exponent takes the form: $-2\pi^2[h^2a^{*2}U_{11} + ... + 2hka^*b^*U_{12}]$

	U_{11}	U_{22}	U_{33}	U_{23}	U_{13}	U_{12}
O(1)	0.0326(5)	0.0429(6)	0.0469(6)	0.0078(5)	0.0141(4)	-0.0043(4)
O(2)	0.0399(6)	0.0493(6)	0.0473(6)	0.0137(5)	0.0255(5)	0.0023(5)
N(1)	0.0391(6)	0.0378(6)	0.0466(7)	0.0132(5)	0.0265(5)	0.0092(5)
N(2)	0.0286(6)	0.0368(6)	0.0419(6)	0.0090(5)	0.0173(5)	0.0020(5)
C(1)	0.0511(9)	0.0424(8)	0.0549(9)	0.0146(7)	0.0323(8)	0.0155(7)
C(2)	0.0616(11)	0.0580(10)	0.0664(11)	0.0148(8)	0.0464(9)	0.0189(8)
C(3)	0.0493(9)	0.0664(11)	0.0730(12)	0.0230(9)	0.0438(9)	0.0128(8)
C(4)	0.0359(8)	0.0517(9)	0.0569(9)	0.0184(7)	0.0259(7)	0.0058(7)
C(5)	0.0309(7)	0.0394(7)	0.0413(7)	0.0174(6)	0.0185(6)	0.0103(6)
C(6)	0.0273(6)	0.0342(7)	0.0374(7)	0.0079(5)	0.0159(5)	0.0033(5)
C(7)	0.0324(7)	0.0463(8)	0.0365(7)	0.0087(6)	0.0170(6)	0.0055(6)
C(8)	0.0333(7)	0.0468(8)	0.0403(8)	0.0070(6)	0.0181(6)	0.0069(6)
C(9)	0.0348(7)	0.0429(8)	0.0398(7)	0.0060(6)	0.0196(6)	0.0055(6)
C(10)	0.0356(7)	0.0396(8)	0.0411(8)	0.0015(6)	0.0177(6)	0.0009(6)
C(11)	0.0379(8)	0.0519(9)	0.0426(8)	0.0064(7)	0.0194(6)	-0.0040(6)
C(12)	0.0360(7)	0.0533(9)	0.0446(8)	0.0189(7)	0.0239(6)	0.0143(6)
C(13)	0.0505(10)	0.0867(13)	0.0422(9)	0.0206(9)	0.0177(8)	0.0231(9)
C(14)	0.0765(14)	0.0625(12)	0.0956(16)	0.0491(12)	0.0277(12)	0.0116(10)
C(15)	0.0754(13)	0.0559(11)	0.0740(12)	-0.0130(9)	0.0516(11)	-0.0161(9)
C(16)	0.0769(13)	0.0433(9)	0.0735(12)	0.0080(8)	0.0495(10)	0.0135(8)
C(17)	0.0788(14)	0.0598(11)	0.0572(11)	-0.0066(9)	0.0287(10)	-0.0011(10)

Table S7. Bond lengths [Å] for compound **40a**.

atom-atom	distance	atom-atom	distance
O(1)-N(2)	1.4250(14)	O(2)-C(11)	1.4298(18)
N(1)-C(5)	1.3397(18)	N(1)-C(1)	1.3531(18)
N(2)-C(5)	1.4013(17)	N(2)-C(6)	1.4815(16)

C(1)-C(2)	1.386(2)	C(1)-C(16)	1.510(2)
C(2)-C(3)	1.375(3)	C(3)-C(4)	1.373(2)
C(4)-C(5)	1.3988(19)	C(6)-C(12)	1.513(2)
C(6)-C(7)	1.5268(18)	C(7)-C(8)	1.5319(18)
C(8)-C(9)	1.5040(19)	C(9)-C(10)	1.329(2)
C(9)-C(15)	1.498(2)	C(10)-C(11)	1.490(2)
C(12)-C(13)	1.323(2)	C(12)-C(14)	1.491(2)
C(16)-C(17)	1.499(3)	O(1)-H(1)	0.8400
O(2)-H(2)	0.8400	C(2)-H(2A)	0.9500
C(3)-H(3A)	0.9500	C(4)-H(4A)	0.9500
C(6)-H(6A)	1.0000	C(7)-H(7A)	0.9900
C(7)-H(7B)	0.9900	C(8)-H(8A)	0.9900
C(8)-H(8B)	0.9900	C(10)-H(10A)	0.9500
C(11)-H(11A)	0.9900	C(11)-H(11B)	0.9900
C(13)-H(13A)	0.9500	C(13)-H(13B)	0.9500
C(14)-H(14A)	0.9800	C(14)-H(14B)	0.9800
C(14)-H(14C)	0.9800	C(15)-H(15A)	0.9800
C(15)-H(15B)	0.9800	C(15)-H(15C)	0.9800
C(16)-H(16A)	0.9900	C(16)-H(16B)	0.9900
C(17)-H(17A)	0.9800	C(17)-H(17B)	0.9800
C(17)-H(17C)	0.9800		

Symmetry transformations used to generate equivalent atoms:

Table S8. Bond angles [°] for compound **40a**.

atom-atom-atom	angle	atom-atom-atom	angle
C(5)-N(1)-C(1)	118.61(12)	C(5)-N(2)-O(1)	111.08(10)
C(5)-N(2)-C(6)	117.64(11)	O(1)-N(2)-C(6)	110.28(10)
N(1)-C(1)-C(2)	121.89(15)	N(1)-C(1)-C(16)	116.41(13)
C(2)-C(1)-C(16)	121.69(14)	C(3)-C(2)-C(1)	118.67(15)
C(4)-C(3)-C(2)	120.51(14)	C(3)-C(4)-C(5)	117.94(15)
N(1)-C(5)-C(4)	122.37(13)	N(1)-C(5)-N(2)	115.66(11)
C(4)-C(5)-N(2)	121.85(13)	N(2)-C(6)-C(12)	112.93(11)
N(2)-C(6)-C(7)	109.42(11)	C(12)-C(6)-C(7)	114.38(11)
C(6)-C(7)-C(8)	111.39(11)	C(9)-C(8)-C(7)	113.96(12)
C(10)-C(9)-C(15)	124.80(13)	C(10)-C(9)-C(8)	119.75(13)
C(15)-C(9)-C(8)	115.44(12)	C(9)-C(10)-C(11)	128.02(13)
O(2)-C(11)-C(10)	109.29(12)	C(13)-C(12)-C(14)	122.11(16)
C(13)-C(12)-C(6)	118.92(15)	C(14)-C(12)-C(6)	118.97(14)
C(17)-C(16)-C(1)	113.32(15)	N(2)-O(1)-H(1)	109.5
C(11)-O(2)-H(2)	109.5	C(3)-C(2)-H(2A)	120.7
C(1)-C(2)-H(2A)	120.7	C(4)-C(3)-H(3A)	119.7
C(2)-C(3)-H(3A)	119.7	C(3)-C(4)-H(4A)	121.0
C(5)-C(4)-H(4A)	121.0	N(2)-C(6)-H(6A)	106.5

C(12)-C(6)-H(6A)	106.5	C(7)-C(6)-H(6A)	106.5
C(6)-C(7)-H(7A)	109.3	C(8)-C(7)-H(7A)	109.3
C(6)-C(7)-H(7B)	109.3	C(8)-C(7)-H(7B)	109.3
H(7A)-C(7)-H(7B)	108.0	C(9)-C(8)-H(8A)	108.8
C(7)-C(8)-H(8A)	108.8	C(9)-C(8)-H(8B)	108.8
C(7)-C(8)-H(8B)	108.8	H(8A)-C(8)-H(8B)	107.7
C(9)-C(10)-H(10A)	116.0	C(11)-C(10)-H(10A)	116.0
O(2)-C(11)-H(11A)	109.8	C(10)-C(11)-H(11A)	109.8
O(2)-C(11)-H(11B)	109.8	C(10)-C(11)-H(11B)	109.8
H(11A)-C(11)-H(11B)	108.3	C(12)-C(13)-H(13A)	120.0
C(12)-C(13)-H(13B)	120.0	H(13A)-C(13)-H(13B)	120.0
C(12)-C(14)-H(14A)	109.5	C(12)-C(14)-H(14B)	109.5
H(14A)-C(14)-H(14B)	109.5	C(12)-C(14)-H(14C)	109.5
H(14A)-C(14)-H(14C)	109.5	H(14B)-C(14)-H(14C)	109.5
C(9)-C(15)-H(15A)	109.5	C(9)-C(15)-H(15B)	109.5
H(15A)-C(15)-H(15B)	109.5	C(9)-C(15)-H(15C)	109.5
H(15A)-C(15)-H(15C)	109.5	H(15B)-C(15)-H(15C)	109.5
C(17)-C(16)-H(16A)	108.9	C(1)-C(16)-H(16A)	108.9
C(17)-C(16)-H(16B)	108.9	C(1)-C(16)-H(16B)	108.9
H(16A)-C(16)-H(16B)	107.7	C(16)-C(17)-H(17A)	109.5
C(16)-C(17)-H(17B)	109.5	H(17A)-C(17)-H(17B)	109.5
C(16)-C(17)-H(17C)	109.5	H(17A)-C(17)-H(17C)	109.5
H(17B)-C(17)-H(17C)	109.5		

Symmetry transformations used to generate equivalent atoms:

Table S9. Torsion angles [°] for compound **40a**.

atom-atom-atom-atom	angle	atom-atom-atom-atom	angle
C(5)-N(1)-C(1)-C(2)	0.4(2)	C(5)-N(1)-C(1)-C(16)	-179.02(14)
N(1)-C(1)-C(2)-C(3)	-1.2(3)	C(16)-C(1)-C(2)-C(3)	178.21(17)
C(1)-C(2)-C(3)-C(4)	0.8(3)	C(2)-C(3)-C(4)-C(5)	0.4(3)
C(1)-N(1)-C(5)-C(4)	0.8(2)	C(1)-N(1)-C(5)-N(2)	176.68(13)
C(3)-C(4)-C(5)-N(1)	-1.2(2)	C(3)-C(4)-C(5)-N(2)	-176.83(14)
O(1)-N(2)-C(5)-N(1)	177.34(11)	C(6)-N(2)-C(5)-N(1)	48.93(16)
O(1)-N(2)-C(5)-C(4)	-6.74(18)	C(6)-N(2)-C(5)-C(4)	-135.14(14)
C(5)-N(2)-C(6)-C(12)	62.28(15)	O(1)-N(2)-C(6)-C(12)	-66.50(14)
C(5)-N(2)-C(6)-C(7)	-169.07(11)	O(1)-N(2)-C(6)-C(7)	62.14(13)
N(2)-C(6)-C(7)-C(8)	177.64(11)	C(12)-C(6)-C(7)-C(8)	-54.53(16)
C(6)-C(7)-C(8)-C(9)	-174.44(12)	C(7)-C(8)-C(9)-C(10)	121.23(16)
C(7)-C(8)-C(9)-C(15)	-59.22(19)	C(15)-C(9)-C(10)-C(11)	-0.6(3)
C(8)-C(9)-C(10)-C(11)	178.85(14)	C(9)-C(10)-C(11)-O(2)	-120.37(17)
N(2)-C(6)-C(12)-C(13)	-107.49(15)	C(7)-C(6)-C(12)-C(13)	126.48(15)
N(2)-C(6)-C(12)-C(14)	72.10(17)	C(7)-C(6)-C(12)-C(14)	-53.92(18)
N(1)-C(1)-C(16)-C(17)	-62.6(2)	C(2)-C(1)-C(16)-C(17)	117.94(19)

Symmetry transformations used to generate equivalent atoms:

Table S10. Hydrogen bonds for compound **40a** [Å and °].

D-H...A	d(D-H)	d(H...A)	d(D...A)	<(DHA)
O(1)-H(1)...O(2)#1	0.84	1.87	2.6969(15)	167.3
O(2)-H(2)…N(1)#2	0.84	2.02	2.8482(15)	167.0

Symmetry transformations used to generate equivalent atoms:
#1 x-1,y,z ; #2 –x+1,-y+1,-z

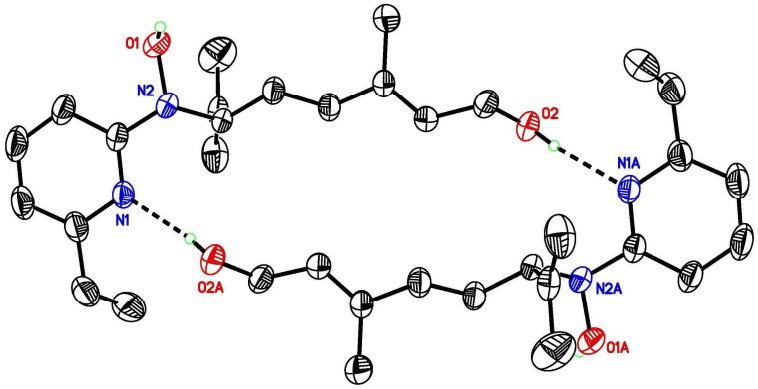


Figure S1. Dimer of compound **40a** displayed with 50% probability ellipsoids. Hydrogen atoms (except those involved in H-bonding) omitted for clarity.

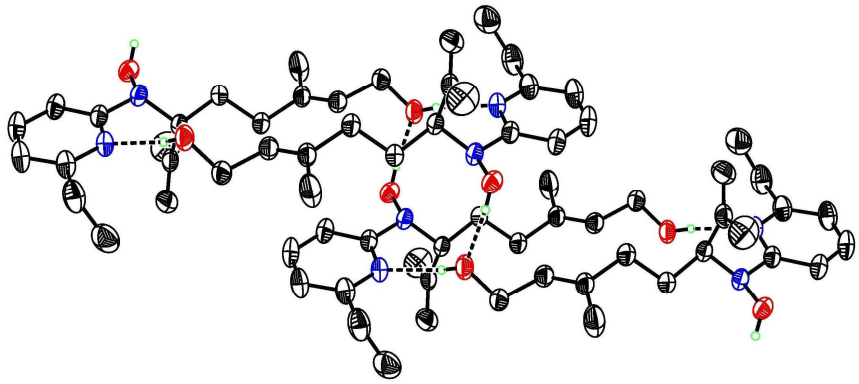


Figure S2. Stacking of dimers of compound **40a** displayed with 50% probability ellipsoids. Hydrogen atoms (except those involved in H-bonding) omitted for clarity.

VIII. References

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