Supporting Information

Dynamic thiol exchange with β-sulfido-α,β-unsaturated carbonyl compounds and dithianes

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General Methods. All reagents were purchased from commercial sources and used as received. An automated Varian Mercury 400MHz spectrometer was used to collect ^{1}H NMR spectra. LCMS were recorded on Agilent 1200 HPLC interfaced to an Agilent 6130 single quadrupole mass spectrometer.

General method for the synthesis of Vinyl sulfides.[1] A mixture of 1 equiv of thiol (**2a-c**) and butynone **3** in THF/water (1:1) was stirred in presence of 15 mol % NaOAc at room temperature for 30-60 min. The reaction mixture was concentrated in *vacuo*. Water and ethyl acetate were added and the aqueous layer was extracted with ethyl acetate. The combined organic layers were washed with brine and dried over Na_2SO_4, concentrated in *vacuo* to yield **1a-c**.

^{1}H NMR for **1a** (400 MHz, $CDCl_3$) δ = 7.71 (d, J = 15.3 Hz, 1H), 7.53 – 7.30 (m, 27H), 7.26 (d, J = 11.3 Hz, 4H), 6.39 (d, J = 11.3 Hz, 4H), 6.01 (d, J = 15.3, 1H), 2.29 (s, 11H), 2.20 (s, 3H). MS for **1a**: $[M+H]^+$ = 179.2.

^{1}H NMR for **1b** (400 MHz, DMSO-d_6) δ 8.05 – 7.88 (m, 10H), 7.71 – 7.54 (m, 12H), 6.60 (d, *J* = 9.6 Hz, 3H), 6.13 (d, *J* = 15.6 Hz, 1H), 2.24 (s, 12H). MS: $[M+H]^+$ = 223.2.

^{1}H NMR for **1c** (400 MHz, D_2O) δ 7.83 (d, *J* = 15.4 Hz, 3H), 7.30 (d, *J* = 9.8 Hz, 1H), 6.38 (d, *J* = 9.8 Hz, 1H), 6.11 (d, *J* = 15.4 Hz, 3H), 3.75 – 3.63 (m, 10H), 2.97 (td, *J* = 6.1, 1.6 Hz, 7H), 2.16 – 2.13 (s, 9H), 2.12 (s, 3H). MS: $[M+H]^+$ = 147.2

(1) Ranu, B. C., Mandal, T. *Aust. J. Chem.*, **2007**, 60, 223.

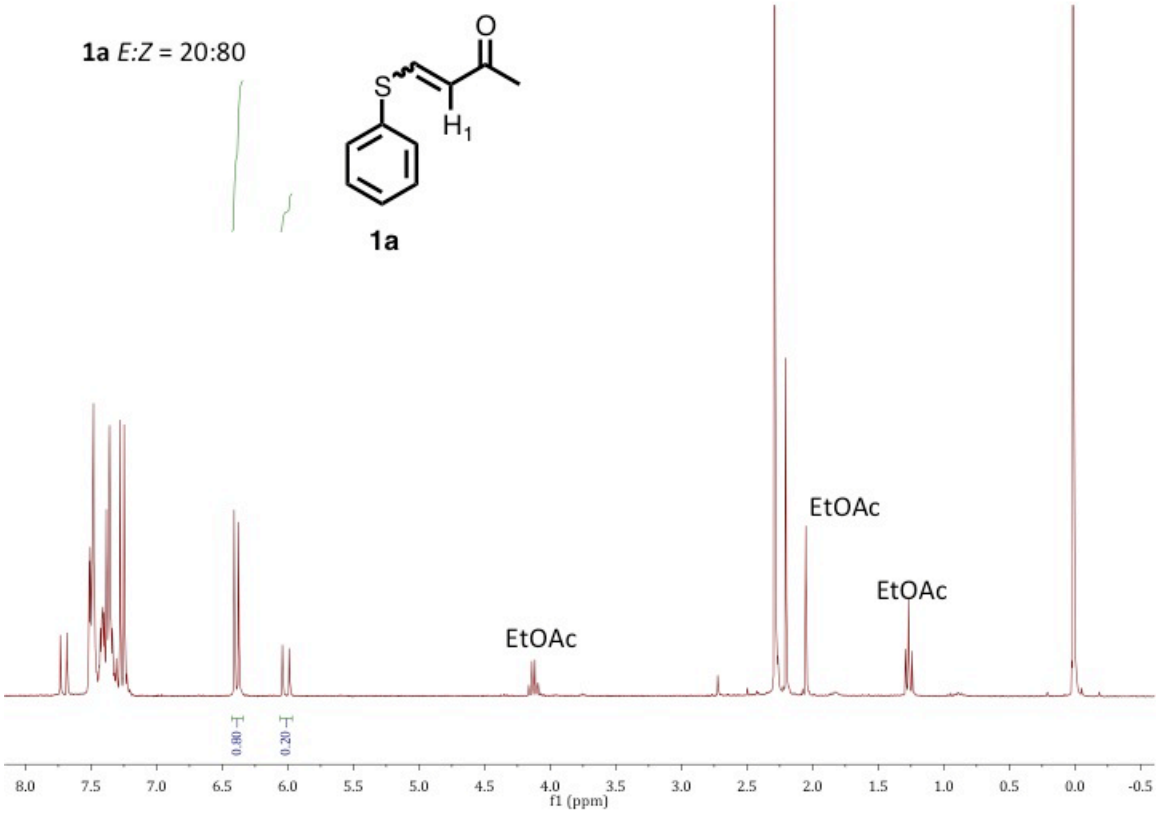

Figure S1. ^{1}H NMR of **1a.**

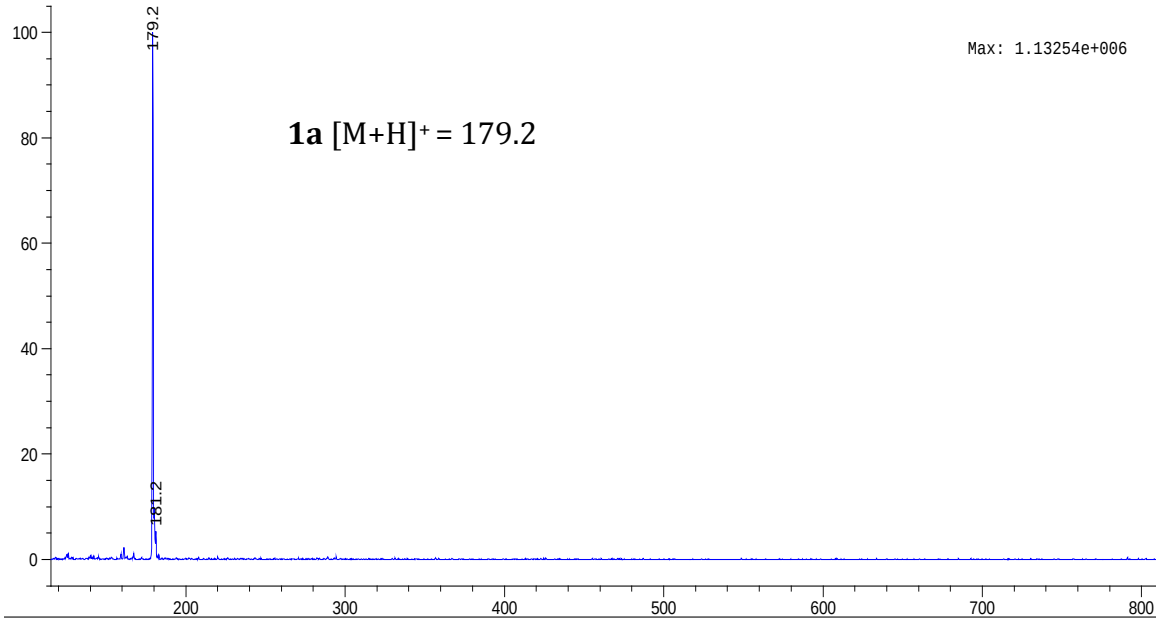

Figure S2. MS for **1a.**

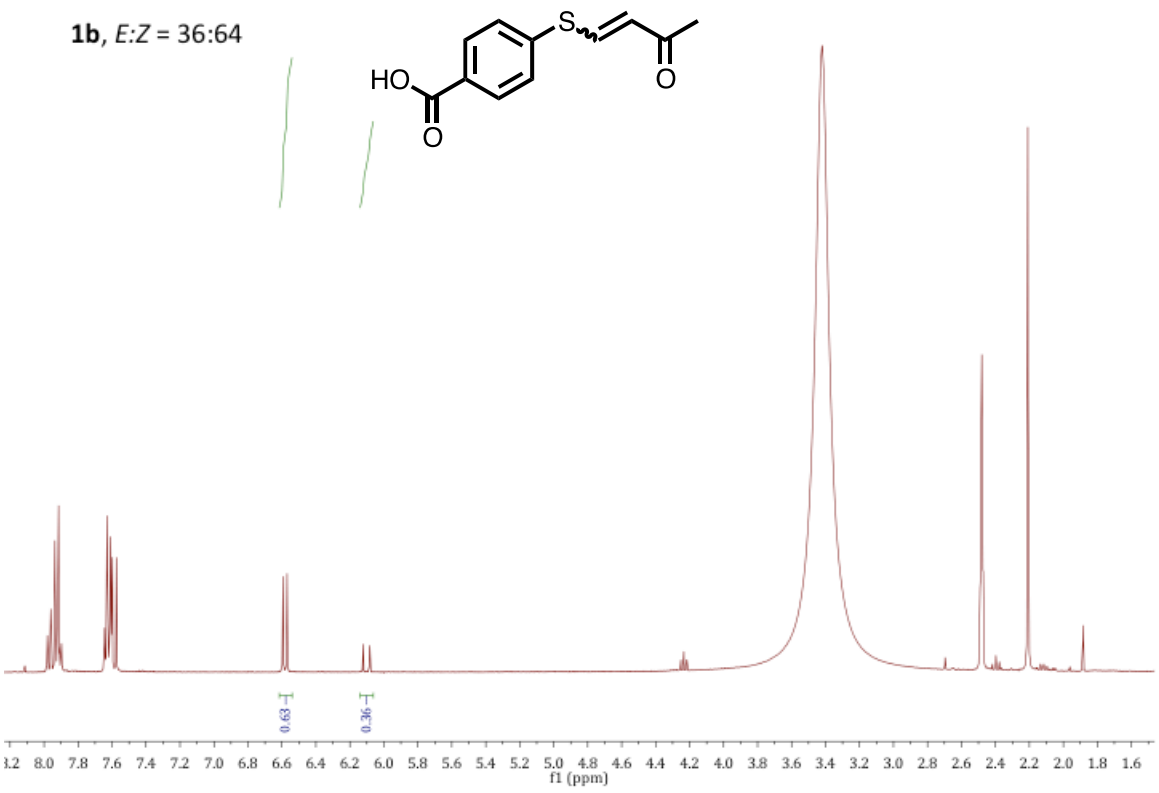

Figure S3. ^{1}H NMR of **1b.**

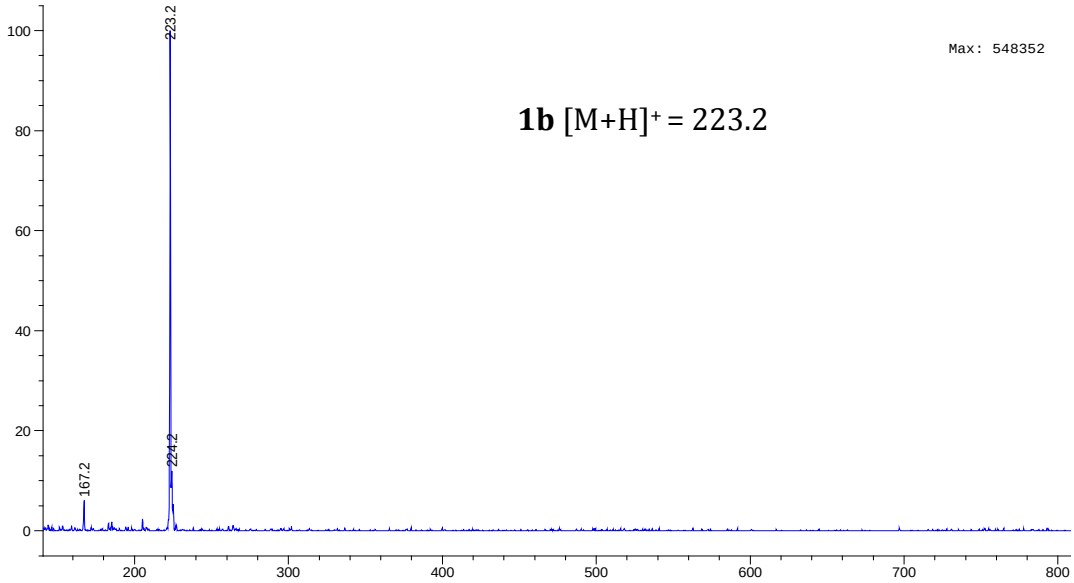

Figure S4. MS for **1b.**

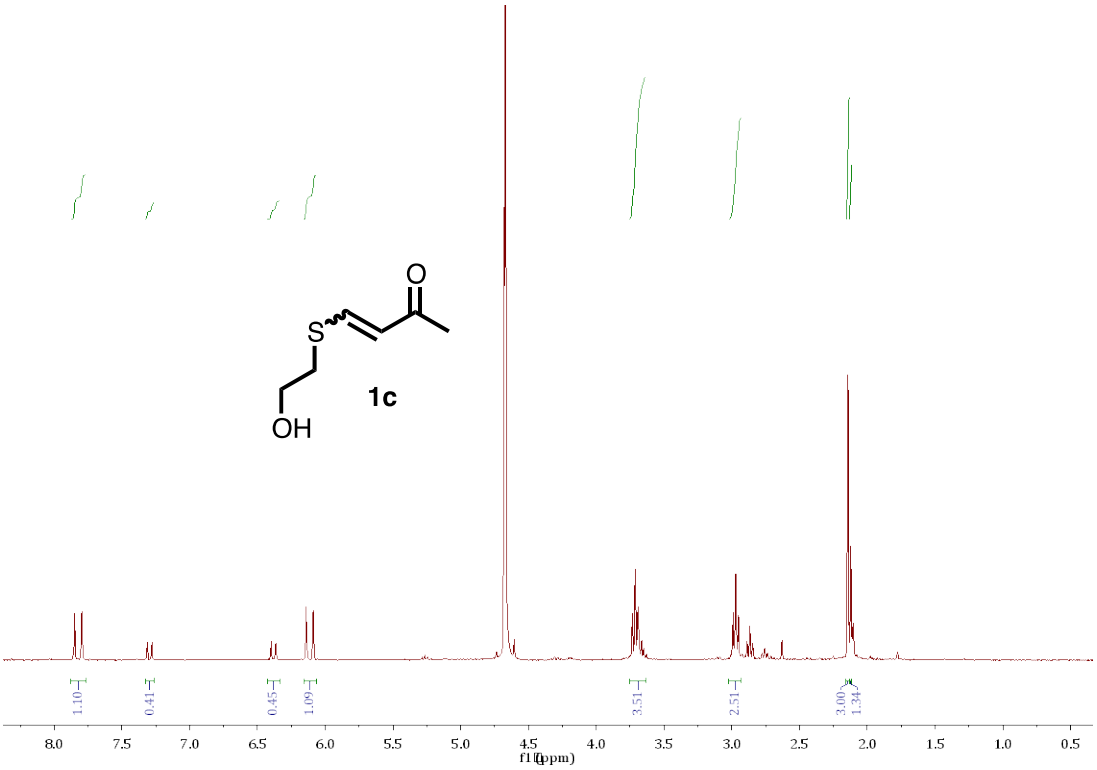

Figure S5. ^{1}H NMR of **1c.**

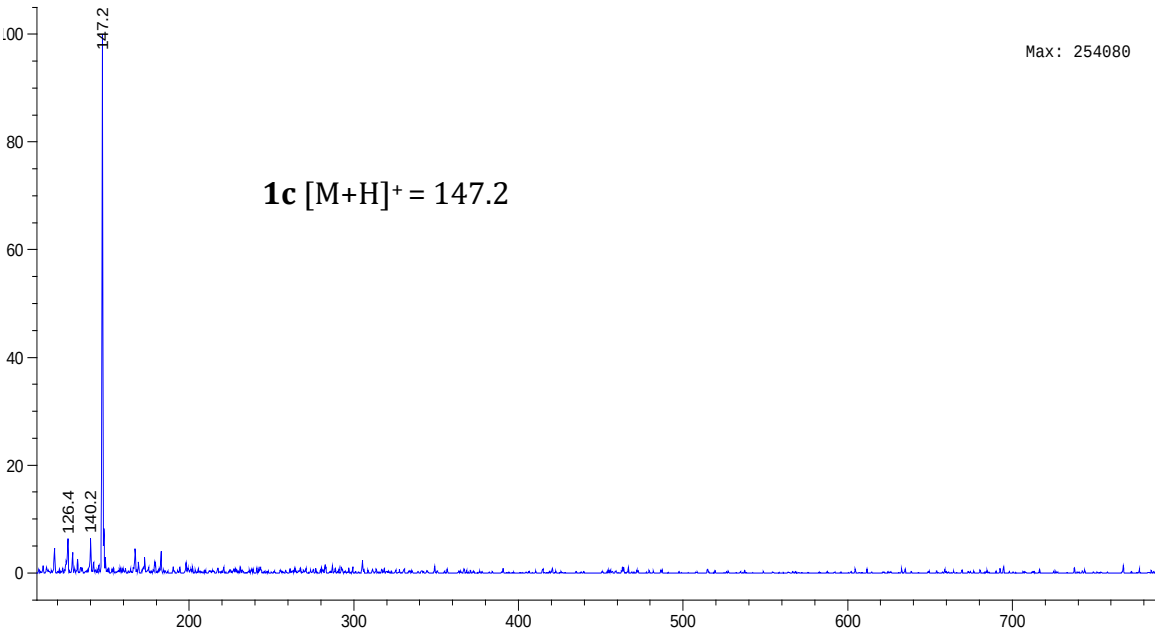

Figure S6. MS for **1c.**

Exchange Studies of VSC's and thiols in DMSO-d_6

The exchange studies with **1a** and thiols **2c** and **2b** were carried out in DMSO-d_6 and monitored by ^{1}H-NMR. 10 μMol solution of **1a** was prepared (1.8 mg/mL) and 1 equiv of Et_3N was added. To this **2c** (1 mg, 1.2 equiv) was added and the ^{1}H-NMR was recorded every 5 min for 2 hours. The spectra did not change from 50 min to 2 hours. **2b** (1.7 mg, 1.2 equiv) was then added and ^{1}H-NMR was recorded 5 min, 1 hour, 2 hours, 14 hours and 24 hours. The spectra did not change from 14 hours to 24 hours (Figure 1).

Exchange Studies of VSC's and thiols in Phosphate Buffer in D_2O/DMSO-d_6 (4:1)

10 mL phosphate buffer solution (PBS, 10 mMol, pD = 7.7) was prepared using D_2O/DMSO-d_6 (4:1).

10 μMol solution of **1c** (2.2 mg/mL) was prepared in PBS (pD = 7.7). To this **2c** (1 mg) was added and the ^{1}H NMR were recorded every 5 min for 2 hours (Figure 2).

Exchange studies of BDTC's and thiols in DMSO-d_6

Compound **6** was dissolved in DMSO-d_6 and 1 equiv of Et_3N and excess thiophenol **2a** was added and the ^{1}H-NMR and LCMS were recorded for 30 days. The stack of ^{1}H NMR is shown is Figure S7.

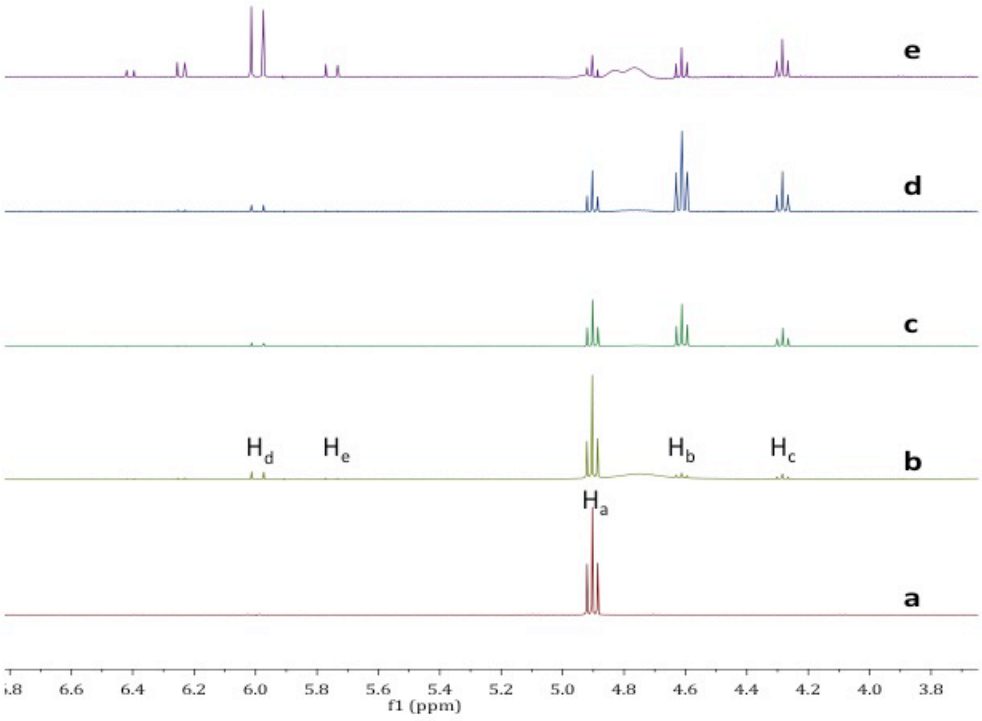

Figure S7. ^{1}H NMR monitoring of Et_3N catalysed dithiane exchange in DMSO-d_6. (a) Partial ^{1}H NMR of **6**. (b) 1 hour after the addition of **2c.** (c) 17 hours after the addition of **2c**. (d) 3 days after the addition of **2c**. (e) 30 days after the addition of **2c**.

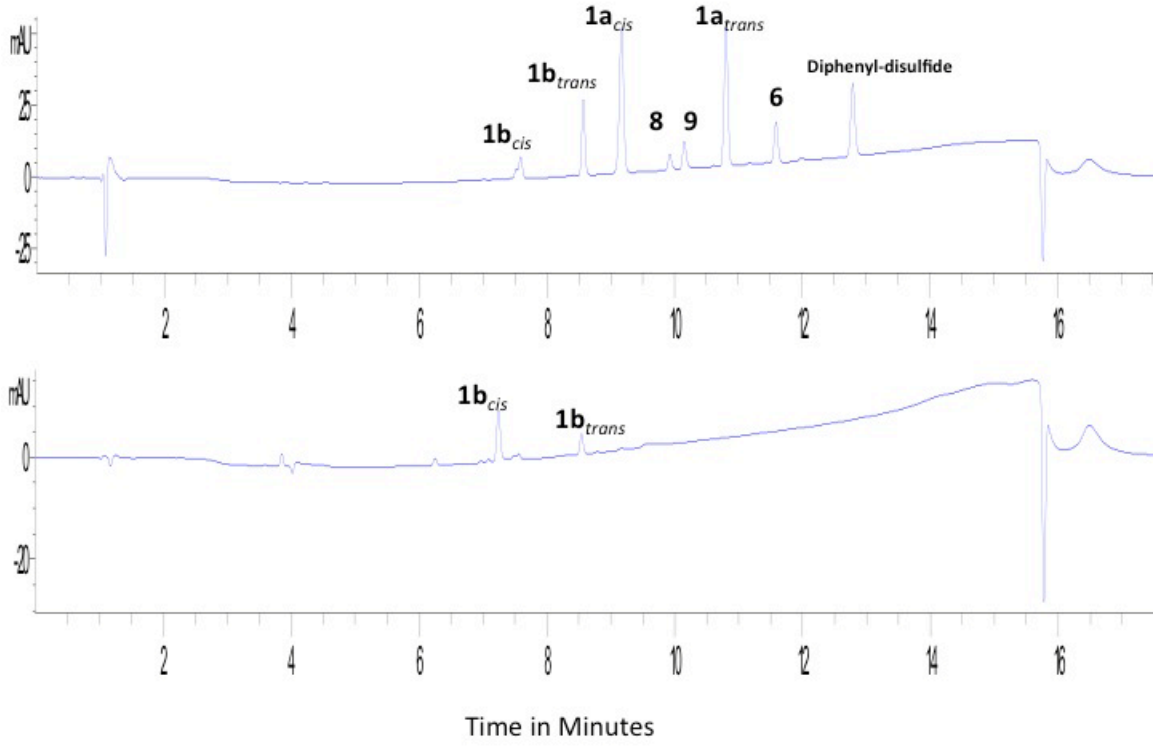

Figure S8. LCMS monitoring. (a) LCMS of **1b**. (b) LCMS after 2 hours of addition of **2a** to **1b**.

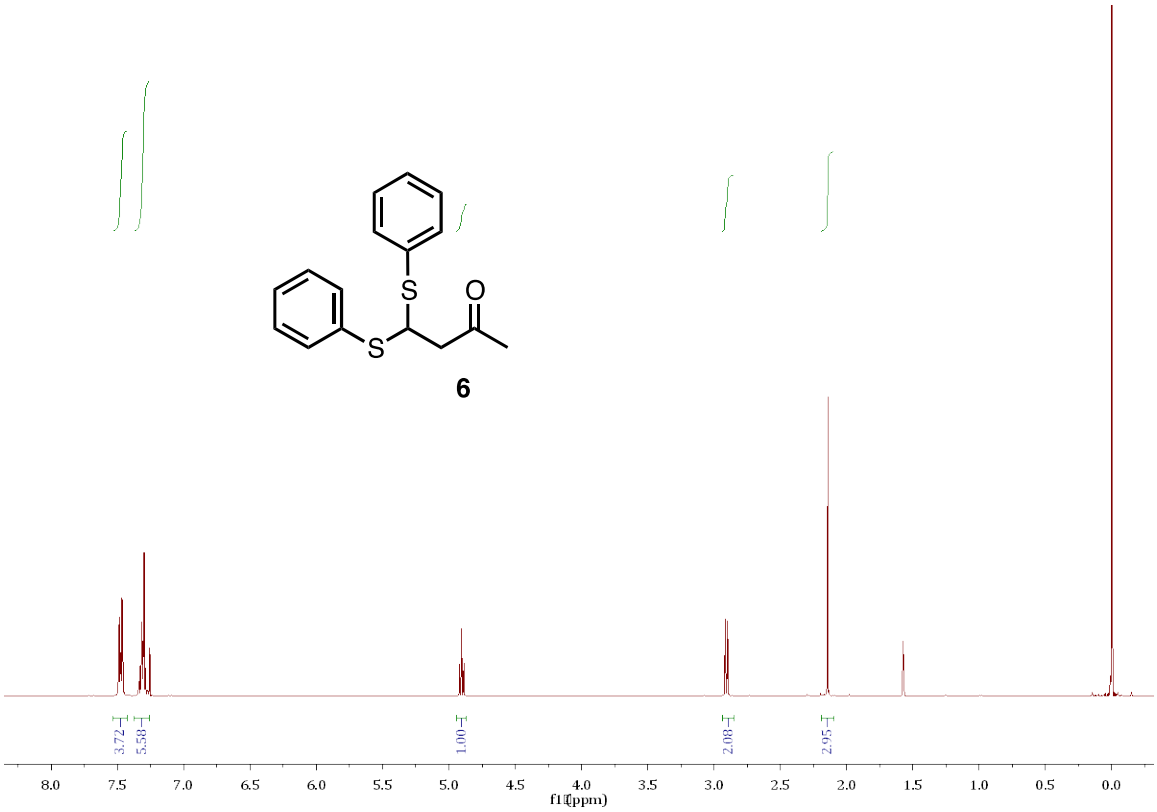

Figure S9. ^{1}H NMR of **6**.

Compound **6**: ^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.53 – 7.43 (m, 4H), 7.37 – 7.26 (m, 6H), 4.90 (t, *J* = 6.9 Hz, 1H), 2.91 (d, *J* = 7.0 Hz, 2H), 2.14 (s, 3H).

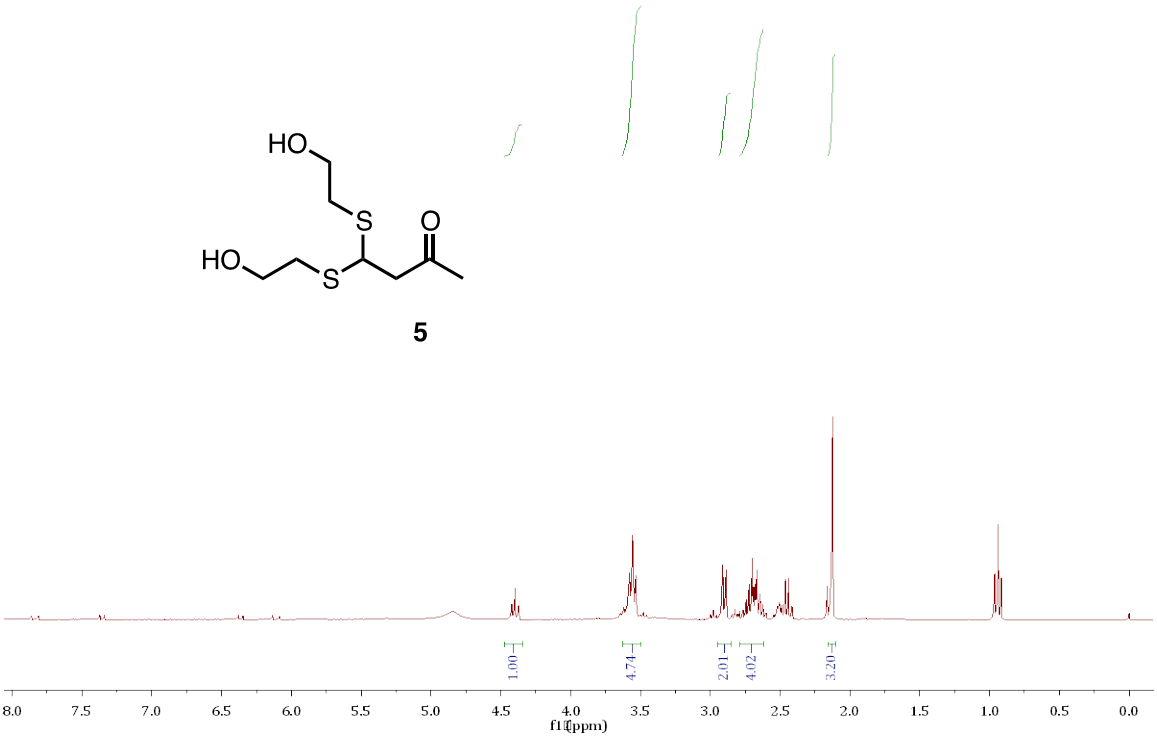

Figure S10. ^{1}H NMR of compound **5**, synthesized in NMR tube by adding **2c** to **1c** in presence of Et_3N.

Compound **5:** ^{1}H NMR (400 MHz, DMSO-d_6) δ 4.40 (t, J = 7.4, 1H), 3.63 – 3.49 (m, 4H), 2.90 (d, J = 7.4 Hz, 2H), 2.79 – 2.62 (m, 4H), 2.13 (s, 3H).