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Supporting Information

Shape-Persistent [4+4] Imine Cages with a Truncated Tetrahedral Geometry

Jochen C. Lauer,[a] Wen-Shan Zhang,[b] Frank Rominger,[a] Rasmus R. Schröder,[b] and Michael Mastalerz*[a]

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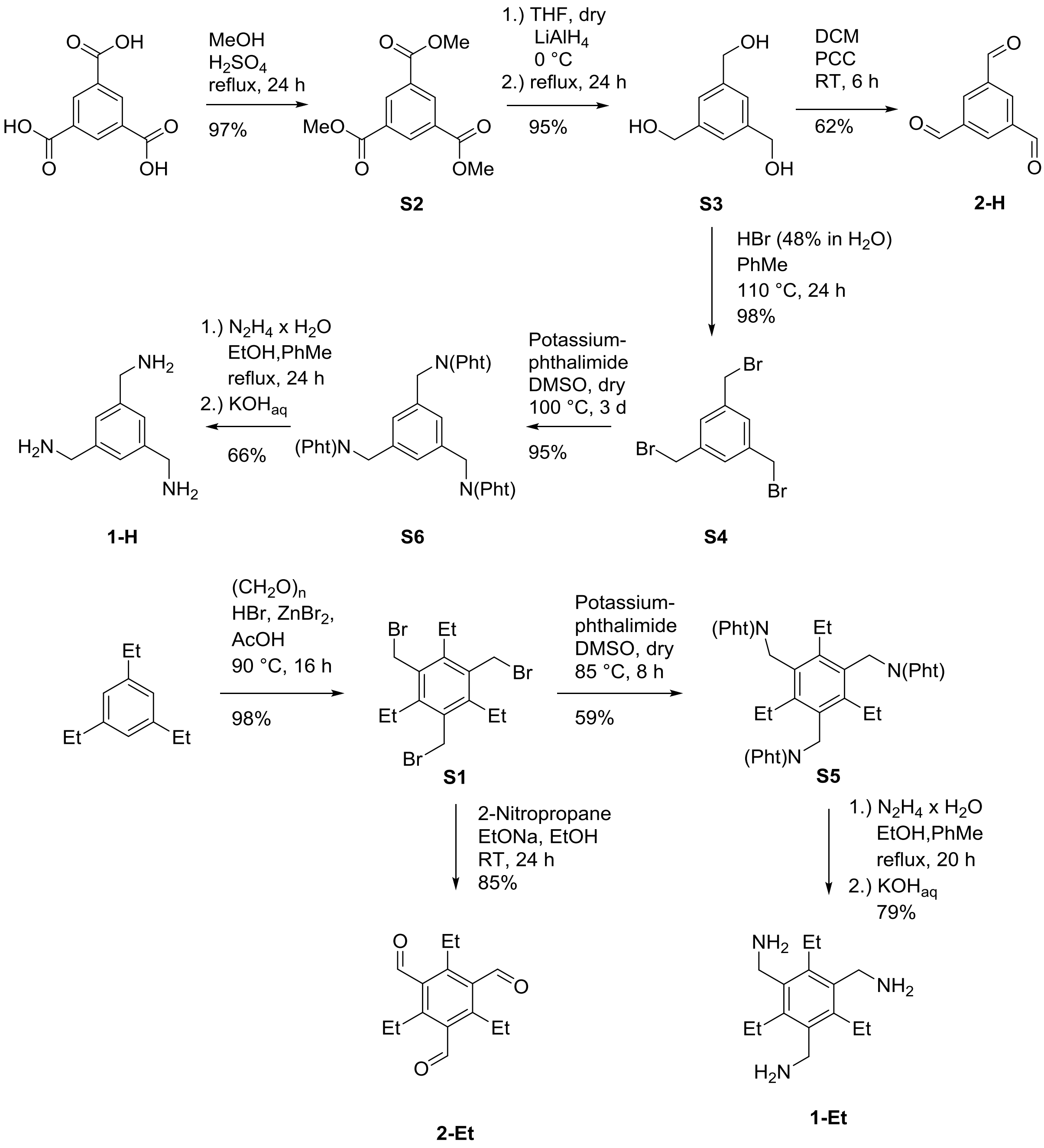
1 General Remarks

All reagents and solvents were used without further purification unless otherwise noted. For thin layer chromatography silica gel 60 F254 plates from Merck were used and examined under UV-light irradiation (254 nm and 365 nm). Flash column chromatography was performed on silica gel from Sigma-Aldrich (particle size: 0.04-0.063 mm) using petroleum ether, dichloromethane, chloroform, toluene, methanol, acetone and/or ethyl acetate. Melting points (not corrected) were measured with a Büchi Melting Point B-545. IR-Spectra were recorded on a Bruker Tensor 27 spectrometer on a ZnSe ATR crystal. NMR spectra were taken on a Bruker DRX 300 (300 MHz), Bruker Avance 300 III (300 MHz), Bruker Avance III 400 (400 MHz), Bruker Avance III 500 (500 MHz) and Bruker Avance III 600 (600 MHz) spectrometer. Chemical shifts (δ) are reported in parts per million (ppm) relative to traces of the non-deuterated solvent in the corresponding deuterated solvent. HRMS experiments were carried out on a Fourier Transform Ion Cyclotron Resonance (FTICR) mass spectrometer solariX (Bruker Daltonik GmbH, Bremen, Germany) equipped with a 7.0 T superconducting magnet and interfaced to an Apollo II Dual ESI/MALDI source. MALDI-TOF MS experiments were carried out on a Bruker Daltonik Reflex III, on a Bruker ApexQe or on a Bruker AutoFlex Speed TOF with DCTB (*trans*-2-[3-(4-*tert*-butylphenyl)-2-methyl-2-propenylidene]malononitrile) as matrix. The electron micrographs are obtained using a field emission scanning electron microscope Zeiss Ultra 55. The samples are dispersed in acetonitrile with the aid of ultrasound and drop-cust on a piece of silicium wafer (p-type, <100>, single-side polished) pre-cleaned with aceton und isopropanol and subsequently with air-plasma. The samples were imaged using a 1.2 kV primary beam at 3.5 mm working distance, with secondary electrons collected using a SE detector and backscaterred electrons using a EsB detector. TGA was measured on a Mettler-Toledo TGA/DSC1 instrument with a TGA/DSC-Sensor 1100 equipped with a MX1 balance (Mettler-Toledo) and a GC100 gas control box for nitrogen supply. Crystal structure analysis was accomplished on a STOE Stadivari diffractometer with a copper source (λCuKα = 1.54178 Å) or a Bruker APEX-II Quazar area detector. The surface area and porosity was characterised by nitrogen adsorption and desorption analysis at 77.35 K with an autosorb computer-controlled surface analyser (AUTOSORB- iQ, Quantachrome), typically 10-40 mg were loaded. Powder X-ray diffraction was measured using a Stoe Stadi 611KLS/N 61263 diffractometer.

2 Synthesis and characterization



Synthesis of 1,3,5-tris(bromomethyl)-2,4,6-triethylbenzene (S1): At room temperature, hydrobromic acid (100 mL, 33% in AcOH) was added to 1,3,5-triethylbenzene (10 mL, 53.1 mmol) and paraformaldehyde (17 g, 560 mmol). The suspension was stirred and $ZnBr_2$ (19.7 g, 88 mmol) was added slowly. After complete addition, the mixture was stirred vigorously at 90 °C for 16 hours. The reaction mixture was cooled to room temperature and the white solid was filtered off, washed with water (300 mL), and dried under vacuum overnight to give 23.2 g (2 mmol, 98%) of 1,3,5-tris(bromomethyl)-2,4,6-triethylbenzene as a colorless solid. M.p.: 173 °C. ^{1}H NMR (300 MHz, $CDCl_3$): δ = 4.58 (s, 6H, -CH_2Br), 2.95 (q, J = 7.6 Hz, 6H, -C$H_2$$CH_3$), 1.34 (t, J = 7.6 Hz, 9H, -CH_2CH_3) ppm. The analytical data are consistent with those from literature.[S1]

Synthesis of trimethyl-1,3,5-benzenetricarboxylate (S2): 1,3,5-Benzenetricarboxylic acid (42 g, 200 mmol) was suspended in a solution of methanol (530 mL) and sulfuric acid (13 mL, 97%). The suspension was refluxed for 24 hours and subsequently cooled to room temperature. A saturated solution of $NaHCO_3$ (500 mL, in water) was added slowly and the mixture was filtered. The residue was washed with water (1000 mL) and the filtrate extracted with diethyl ether (500 mL). The residue and the organic layer were combined and the solvent removed under reduced pressure to give 49 g (97%) of trimethyl-1,3,5-benzenetricarboxylate as a colorless solid. M.p.: 144 °C. ^{1}H NMR (300 MHz, $CDCl_3$): δ = 8.86 (s, 3H, Ar*H*), 3.98 (s, 9H, -COOC*H₃*) ppm. The analytical data are consistent with those from literature.[S2]

Synthesis of 1,3,5-tris(hydroxymethyl)benzene (S3): Under nitrogen atmosphere, a solution of trimethyl-1,3,5-benzenetricarboxylate (5.04 g, 20 mmol) in dry THF (90 mL) was added dropwise through a pressure-equalized addition funnel to $LiAlH_4$ (3.05 g, mmol) in dry THF (22 mL) at 0 °C. After complete addition, the reaction mixture was refluxed for 24 hours and cooled to room temperature. The reaction was quenched by slow addition of water (50 mL). The reaction mixture was filtered and the residue was extracted first with MeOH (50 mL) then with THF (50 mL). The solvent was removed under reduced pressure to give 3.3 g (95%) of 1,3,5-tris(hydroxymethyl)benzene as a pale yellow solid. M.p.: 76 °C. ^{1}H NMR (300 MHz, D_2O): δ = 7.35 (s, 3H, Ar*H*), 4.69 (s, 6H, -CH_2OH) ppm. The analytical data are consistent with those from literature.[S2]

Synthesis of 1,3,5-tris(bromomethyl)benzene (S4): 1,3,5-tris(hydroxymethyl)benzene (10 g, 60 mmol) was suspended in a mixture of toluene (150 mL) and HBr (100 mL, 48% in H_2O) and refluxed for 24 hours. The reaction mixture was cooled to room temperature and the organic layer was separated. The aqueous layer was extracted with diethylether (2 x 100 mL). The organic layers were combined and the solvent was removed under reduced pressure. The crude product was filtered through a short silica pad (eluent: light petroleum ether/toluene 1:1) to give 21.3 g (98%) of 1,3,5-tris(bromomethyl)benzene as a colorless solid. M.p.: 95 °C. ^{1}H NMR (300 MHz, $CDCl_3$): δ = 7.35 (s, 3H, Ar*H*), 4.46 (s, 6H, -CH_2Br) ppm. The analytical data are consistent with those from literature.[S3]

Synthesis of 1,3,5-triformylbenzene (2-H): 1,3,5-Tris(hydroxymethyl)benzene (1.6 g, 10 mmol) was suspended in DCM (100 mL). Pyridinium chlorochromate (PCC, 6.5 g, 30 mmol) and Celite (3 g) were added and the mixture stirred for 6 hours at room temperature. Subsequently the reaction mixture was diluted with ether (80 mL) and was allowed to stir for further 30 minutes. The reaction mixture was filtered and the residue extracted with DCM (200 mL). The extract was concentrated to dryness under reduced pressure and the crude product obtained was purified by column chromatography (DCM, *R*f = 0.17) to give 1.05 g (62%) of **2-H** as a colorless solid. M.p.: 92 °C. ^{1}H NMR (300 MHz, $CDCl_3$): δ = 10.21 (s, 3H, Ar*H*), 8.64 (s, 3H, -C*H*O) ppm. The analytical data are consistent with those from literature.[S2]

Synthesis of 2,4,6-triethylbenzene-1,3,5-tricarbaldehyde (2-Et): Potassium dichromate (6.6 g, 22.5 mmol) was dissolved in dry DMSO (50 mL). 1,3,5-Tris(bromomethyl)-2,4,6-triethylbenzene (2.2 g, 5 mmol) was added and the reaction mixture heated to 110 °C for 2 hours. The reaction was poured into 200 mL of 10 M NaOH and extracted with DCM (3 x 100 mL). The combined organic layer was washed with brine (100 mL) and water (2 x 100 mL), and dried over $MgSO_4$. The crude product was purified by column chromatography (toluene/ethyl acetate 10:1, R_f = 0.5) to give 450 mg (36%) of **2-Et** as a colorless waxy solid. M.p.: 50 °C. ^{1}H NMR (300 MHz, $CDCl_3$): δ = 10.60 (s, 3H, -C*H*O), 2.99 (q, J = 7.5 Hz, 6H, -CH_2CH_3), 1.25 (t, J = 7.5 Hz, 9H, -CH_2CH_3) ppm. The analytical data are consistent with those from literature.[S4]

Synthesis of 2,4,6-triethylbenzene-1,3,5-tricarbaldehyde (2-Et): Under an argon atmosphere a solution of NaOEt (0.9 g, 13.3 mmol) in absolute ethanol (31 mL) was prepared. To this solution was added 2-nitropropane (1.2 mL, 13.3 mmol) and the mixture was stirred for 5 minutes, followed by the addition of 1,3,5-tris(bromomethyl)-2,4,6-triethylbenzene (1.7 g, 3.9 mmol). The reaction mixture was stirred for 24 hours at room temperature. The solvent was removed in vaccuo, the residue was dissolved in toluene (100 mL) and washed with water (75 mL), $NaOH_{aq}$ (1 M, 75 mL) and again water (75 mL). The organic layer was dried over Na_2SO_4 and filtered. The solvent was removed in vacuo and the crude product purified by column chromatography (toluene/ethyl acetate 10:1, R_f = 0.5) to give 850 mg (85%) of **2-Et** as a colorless waxy solid.[5] M.p.: 50 °C. ^{1}H NMR (300 MHz, $CDCl_3$): δ = 10.60 (s, 3H, -C*H*O), 2.99 (q, J = 7.5 Hz, 6H, -CH_2CH$_3$), 1.25 (t, J = 7.5 Hz, 9H, -CH$_2$CH_3) ppm. The analytical data are consistent with those from literature.[S4]

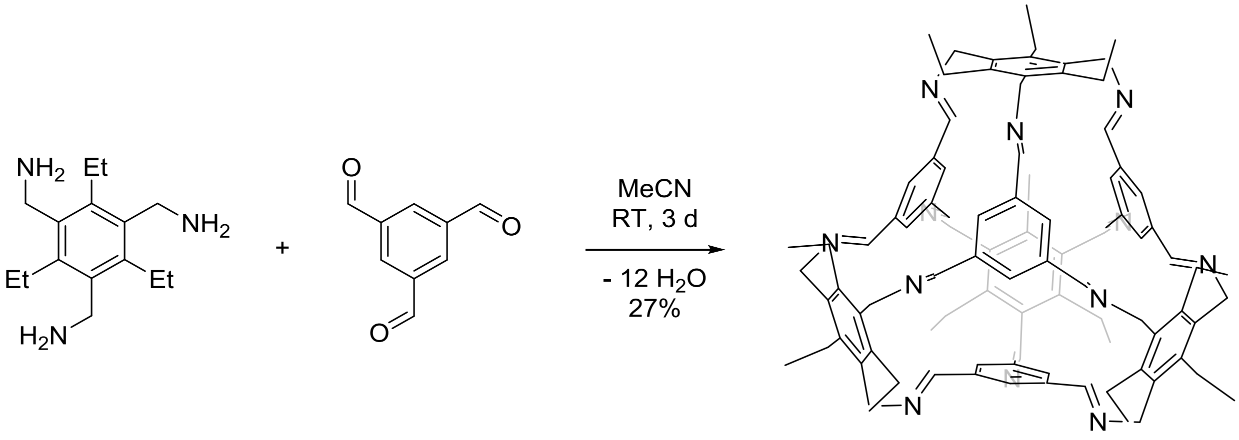
Synthesis of 1,3,5-tris(phthalimidomethyl)-2,4,6-triethylbenzene (S5): A mixture of 1,3,5-tris(bromomethyl)-2,4,6-triethylbenzene (5 g, 11.3 mmol) and potassium phthalimide (8.4 g, 45 mmol) was suspended in dry DMSO (75 mL) and stirred under nitrogen at 85 °C for 8 hours. After the mixture was cooled to room temperature, water (100 mL) was added and the formed precipitate was filtered. The precipitate was suspended in chloroform (200 mL) and the suspension washed with brine (100 mL) and water (100 mL), and dried over Na_2SO_4. The crude product was purified by column chromatography (toluene/ethyl acetate 8:1, R_f = 0.28) to yield 4.2 g (59%) of 1,3,5-tris(phthalimidomethyl)-2,4,6-triethylbenzene as a white solid. M.p.: 234 °C. ^{1}H NMR (300 MHz, CDCl$_3$): δ = 7.81 (dd, J = 5.4, 3.0 Hz, 6H, ArH), 7.68 (dd, J = 5.4, 3.1 Hz, 6H, ArH), 4.94 (s, 6H, -CH_2-), 3.10 (q, J = 7.6 Hz, 6H, -CH_2CH$_3$), 0.97 (t, J = 7.5 Hz, 9H, -CH$_2$CH_3) ppm. The analytical data are consistent with those from literature.[S1]

Synthesis of 1,3,5-tris(phthalimidomethyl)-benzene (S6): A mixture of 1,3,5-tris(bromomethyl)-benzene (5.3 g, 14.8 mmol) and potassium phthalimide (11 g, 60 mmol) was suspended in dry DMSO (90 mL) and stirred under nitrogen at 100 °C for 3 days. After the mixture was cooled to room temperature ,water (200 mL) was added and the mixture extracted with chloroform (3 x 300 mL). The combined organic layer was washed with water (2 x 100 mL) and dried over Na_2SO_4. The crude product was purified by column chromatography (DCM/acetone 20:1, R_f = 0.55) to give 7.6 g (95%) of 1,3,5-tris(phthalimidomethyl)-benzene as a colorless solid. M.p.: 270 °C. ^{1}H NMR (300 MHz, CDCl$_3$): δ = 7.82 (dd, J = 5.5, 3.0 Hz, 6H, ArH), 7.70 (dd, J = 5.4, 3.1 Hz, 6H, ArH), 7.35 (s, 3H, ArH), 4.78 (s, 6H, -CH_2-) ppm. The analytical data are consistent with those from literature.[S6]

Synthesis of 1,3,5-tris(aminomethyl)-2,4,6-triethylbenzene (1-Et): 1,3,5-Tris(phthalimidomethyl)-2,4,6-triethylbenzene (3.84 g, 6 mmol) was dissolved in a mixture of dry ethanol and toluene (210 mL, 2:1 v/v) and heated to reflux with hydrazine hydrate (1.74 mL, 36 mmol) for 20 hours. The mixture was cooled to room temperature, an aqueous solution of KOH (40%, 60 mL) was added and the mixture was extracted with CHCl$_3$ (3 × 100 mL). The combined organic layer was washed with brine (100 mL) and water (100 mL), dried over $MgSO_4$ and filtered. The solvent was removed in vacuo to give 1.18 g (79%) of **1-Et** as a colorless solid. M.p.: 136 °C. ^{1}H NMR (300 MHz, CDCl$_3$): δ = 3.88 (s, 6H, -CH_2NH$_2$), 2.83 (q, J = 7.5 Hz, 6H, -CH_2CH$_3$), 1.39 (s, 6H, -NH_2), 1.24 (t, J = 7.5 Hz, 9H, -CH$_2$CH_3) ppm. The analytical data are consistent with those from literature.[S1]

Synthesis of 1,3,5-tris(aminomethyl)-benzene (1-H): 1,3,5-Tris(phthalimidomethyl)-benzene (2.5 g, 4.5 mmol) was dissolved in a mixture of dry ethanol and toluene (150 mL, 2:1) and heated to reflux with hydrazine hydrate (1.3 mL, 27 mmol) for 24 hours. The mixture was cooled to room temperature and the ethanol was evaporated. To the mixture CHCl$_3$ (100 mL) and an aqueous solution of KOH (40%, 75 mL) was added. The organic layer was separated and the aqueous layer was extracted with CHCl$_3$ (2 × 100 mL). The combined organic layer were washed with water (50 mL), dried over $MgSO_4$ and filtered. The solvent was removed in vacuo to give 500 mg (66%) of **1-H** as a colorless very hygroscopic solid. M.p.: 50 °C. ^{1}H NMR (300 MHz, DMSO-d$_6$): δ = 7.10 (s, 3H, ArH), 3.67 (s, 6H, -CH_2NH$_2$), 1.66 (s, 6H, -NH_2) ppm. The analytical data are consistent with those from literature.[S7]

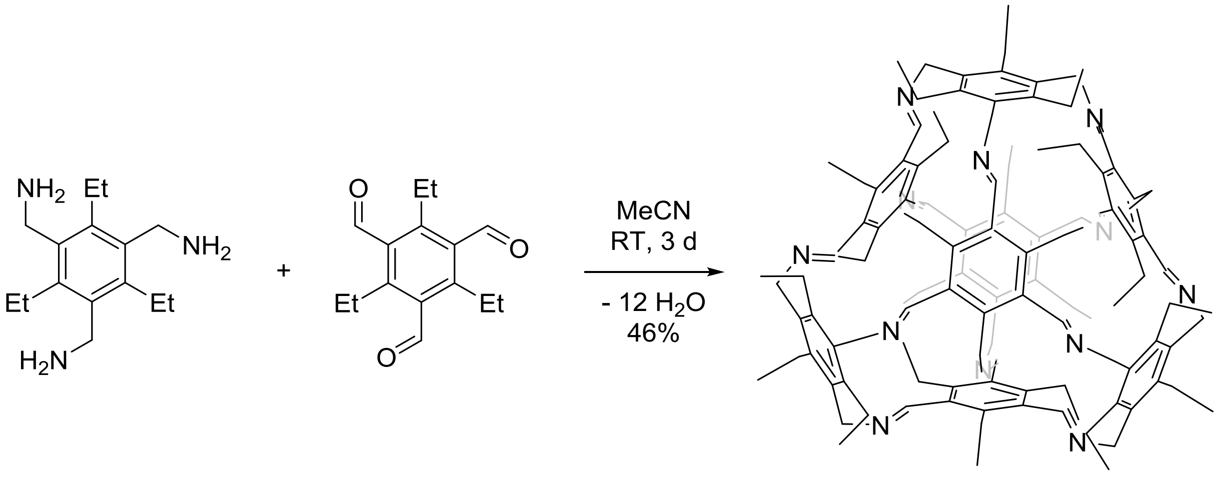
Synthesis of cage compound 3-Et-H:



1-Et **2-H** **3-Et-H**

1,3,5-Triformylbenzene (**2-H**) (120 mg, 740 µmol) was dissolved in MeCN (15 mL). Within 3 hours a solution of 2,4,6-triethylbenzene-1,3,5-trimethanamine (**1-Et**) (185 mg, 740 µmol) in MeCN (22 mL) was added dropwise under vigorous stirring at room temperature. The suspension was stirred for 3 days and afterwards the precipitate was filtered and washed with MeCN (20 mL). The solid residue was extracted with DCM (200 mL) and the solvent of the extract removed in vacuo to give 70 mg (27%) of cage compound **3-Et-H** as a colorless solid. M.p.: 220 °C (decomp.). ^{1}H NMR (400 MHz, CD$_2$Cl$_2$): δ = 8.56 (s, 12H, -C*H*N-), 7.97 (s, 12H, Ar*H*), 4.76 (s, 24H, -CH_2N-), 3.18 (q, *J* = 7.5 Hz, 24H, CH_2CH$_3$), 1.28 (t, *J* = 7.4 Hz, 36H, CH$_2$CH_3) ppm. ^{13}C NMR (101 MHz, CD$_2$Cl$_2$): δ = 160.8 (-*C*HN-), 142.7 (-*C*CH$_2$CH$_3$), 138.0 (-*C*CHN-), 133.1 (-*C*CH$_2$N-), 129.2 (-*C*H), 58.8 (-*C*H$_2$N-), 23.7 (-*C*H$_2$CH$_3$), 16.2 (-CH$_2$*C*H$_3$) ppm. FT-IR (ATR): $\tilde{\nu}$ (cm^{-1}) = 504 w, 529 m, 543 m, 550 m, 558 m, 565 m, 570 m, 581 m, 595 m, 618 m, 660 m, 687 s, 738 m, 762 m, 817 w, 883 m, 938 s, 961 m, 986 m, 1000 m, 1022 m, 1042 m, 1076 m, 1152 m, 1213 w, 1229 m, 1251 m, 1319 m, 1356 m, 1374 m, 1451 m, 1490 m, 1596 m, 1644 vs, 1702 w, 2868 m, 2927 m, 3272 w, 3294 w, 3366 w, 3439 w. MS (MALDI-TOF, DCTB): *m/z* = 1430.817 [M+H]$^+$, 1452.816 [M+Na]$^+$, 1468.794 [M+K]$^+$, 1646.904 [M+12H$_2$O+H]$^+$ (m/z calculated for $C_{96}H_{108}N_{12}$ + H$^+$: 1430.893) . Anal. calcd. for $C_{96}H_{108}N_{12}\cdot 6\,H_2O$: C: 74.97, H: 7.86, N: 10.93, O: 6.24; found: C: 74.94, H: 7.66, N: 10.79.

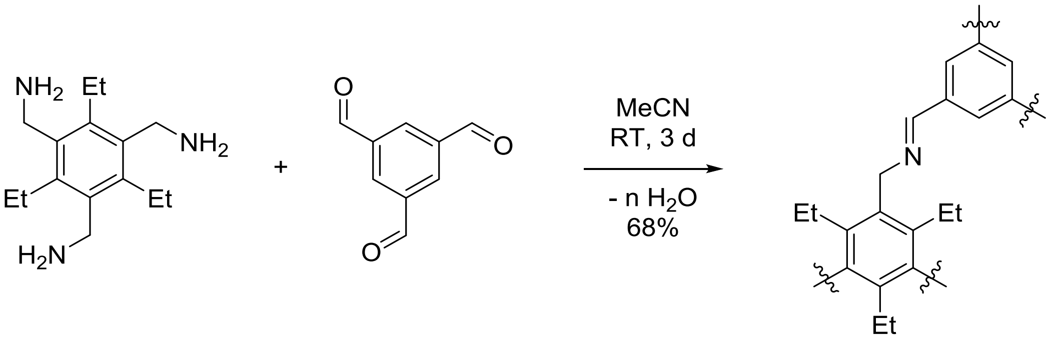
Synthesis of cage compound 3-Et-Et:



1-Et **2-Et** **3-Et-Et**

2,4,6-Triethylbenzene-1,3,5-tricarbaldehyde (**2-Et**) (123 mg, 500 µmol) was dissolved in MeCN (6 mL). Within 2 hours a solution of 2,4,6-triethylbenzene-1,3,5-trimethanamine (**1-Et**) (125 mg, 500 µmol) in MeCN (19 mL) was added dropwise under vigorous stirring at room temperature. The suspension was stirred for 3 d and the precipitate was filtered and washed with MeCN (5 mL). The solid residue was extracted with MeOH (200 mL) and the solvent removed in vacuo to give 103 mg (46%) of cage compound **3-Et-Et** as a colorless solid. M.p.: 240 °C (decomp.). ^{1}H NMR (600 MHz, Tol-d_8): δ = 8.00 (s, 12H, -C*H*N-), 4.90 (s, 24H, -C*H₂*N-), 2.68 (q, J = 7.3 Hz, 24H, -C*H₂*CH₃), 2.37 (q, J = 7.3 Hz, 24H, -C*H₂*CH₃), 1.22 (t, J = 7.4 Hz, 36H, -CH₂C*H₃*), 1.14 (t, J = 7.4 Hz, 36H, -CH₂C*H₃*) ppm. ^{13}C NMR (150 MHz, Tol-d_8): δ = 160.0 (-*C*HN-), 143.5 (-*C*CH₂CH₃), 140.5 (-*C*CH₂CH₃), 134.8(-*C*CHN-), 132.0 (-*C*CH₂N-), 56.8 (-*C*H₂N-), 24.6 (-*C*H₂CH₃), 23.4 (-*C*H₂CH₃), 16.4 (-CH₂*C*H₃), 15.7 (-CH₂*C*H₃) ppm. FT-IR (ATR): ṽ (cm^{-1}) = 604 w, 611 w, 627 w, 640 w, 646 w, 675 w, 690 w, 783 s, 939 m, 961 s, 1015 m, 1045 m, 1076 m, 1111 w, 1232 w, 1250 w, 1281 w, 1315 m, 1373 s, 1433 m, 1454 s, 1489 m, 1556 m, 1643 vs, 1691 m, 2870 m, 2901 m, 2932 s, 2963 s. MS (ESI, DCM/MeOH): *m/z* (%) = 1767.2725 $[M+H]^+$ (100), 1789.2611 $[M+Na]^+$ (22.2), 884.1389 $[M+2H]^{2+}$ (8.5), 894.6312 $[M+H+Na]^{2+}$ (16.3), 905.6225 $[M+2Na]^{2+}$ (8.5) (m/z calculated for $C_{120}H_{156}N_{12}$ + H^+: 1767.2682). Anal. calcd. for $C_{120}H_{156}N_{12}\cdot 5\ H_2O$: C: 77.63, H: 9.01, N: 9.05, O: 4.31; found: C: 77.69, H: 8.93, N: 8.69.

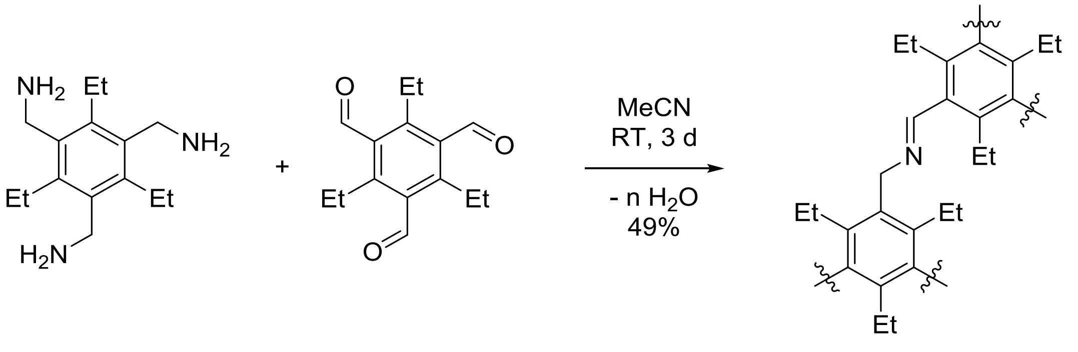
Synthesis of polymer material 3-Et-H:



1-Et **2-H** **3-Et-H-Polymer**

1,3,5-Triformylbenzene (**2-H**) (120 mg, 740 µmol) was dissolved in MeCN (15 mL). Within 3 hours a solution of 2,4,6-triethylbenzene-1,3,5-trimethanamine (**1-Et**) (185 mg, 740 µmol) in MeCN (22 mL) was added dropwise under vigorous stirring at room temperature. The suspension was stirred for 3 days and the precipitate was filtered and washed with MeCN (20 mL). The solid residue was washed with DCM (200 mL) and the residue dried in vacuo to give 190 mg (68%) of **3-Et-H-Polymer** material as a colorless powder. M.p.: 215 °C (decomp.). ^{13}C CP MAS NMR (125 MHz): δ = 164 (-*C*HN-), 148 (-*C*-Ar), 142 (*C*-Ar), 137 (*C*-Ar), 59 (-*C*H$_2$N-), 27 (-*C*H$_2$CH$_3$), 20 (-CH$_2$*C*H$_3$) ppm. FT-IR (ATR): $\tilde{\nu}$ (cm^{-1}) = 663 m, 689 s, 770 w, 876 w, 941 m, 970 m, 1043 m, 1074 w, 1148 m, 1250 m, 1315 m, 1373 m, 1452 m, 1483 w, 1566 w, 1597 m, 1639 vs, 1701 m, 2870 m, 2930 m, 2964 m. Anal. calcd. for $3(C_{24}H_{27}N_3)_n \cdot 4n\ H_2O$: C: 75.56, H: 7.84, N: 11.01, O: 5.59; found: C: 75.45, H: 7.42, N: 10.81.

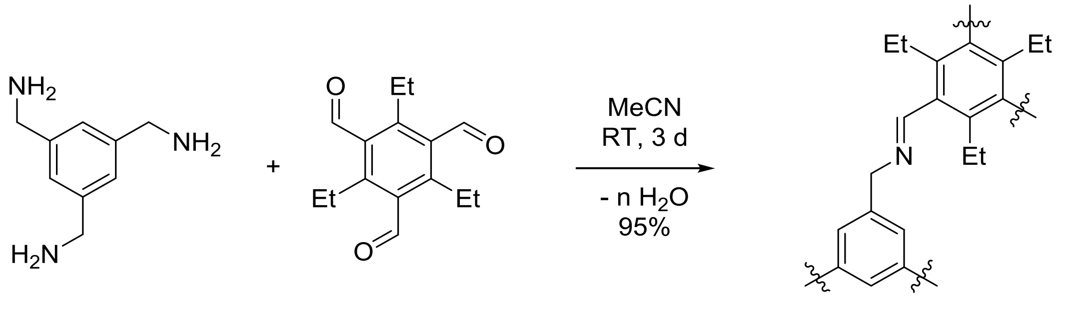
Synthesis of polymer material 3-Et-Et:



1-Et **2-Et** **3-Et-Et-Polymer**

2,4,6-Triethylbenzene-1,3,5-tricarbaldehyde (**2-Et**) (123 mg, 500 µmol) was dissolved in MeCN (6 mL). Within 2 hours a solution of 2,4,6-triethylbenzene-1,3,5-trimethanamine (**1-Et**) (125 mg, 500 µmol) in MeCN (19 mL) was added dropwise under vigorous stirring at room temperature. The suspension was stirred for 3 d and the precipitate was filtered and washed with MeCN (5 mL). The solid residue was washed with MeOH (200 mL) and the residue dried in vacuo to give 110 mg (49%) of **3-Et-Et-Polymer** material as a colorless powder. M.p.: 245 °C (decomp.). ^{13}C CP MAS NMR (125 MHz): δ = 164 (-*C*HN-), 147 (-*C*-Ar), 137 (*C*-Ar), 59 (-*C*H$_2$N-), 28 (-*C*H$_2$CH$_3$), 20 (-CH$_2$*C*H$_3$) ppm. FT-IR (ATR): $\tilde{\nu}$ (cm^{-1}) = 690 vw, 768 m, 937 m, 959 m, 1013 m, 1043 m, 1074 m, 1232 w, 1250 w, 1313 m, 1371 s, 1452 s, 1556 m, 1639 vs, 1690 m, 2870 s, 2930 s, 2963 vs. Anal. calcd. for $(C_{30}H_{39}N_3)_n{\cdot}n\ H_2O$: C: 78.39, H: 8.99, N: 9.14, O: 3.48; found: C: 78.59, H: 8.66, N: 9.07.

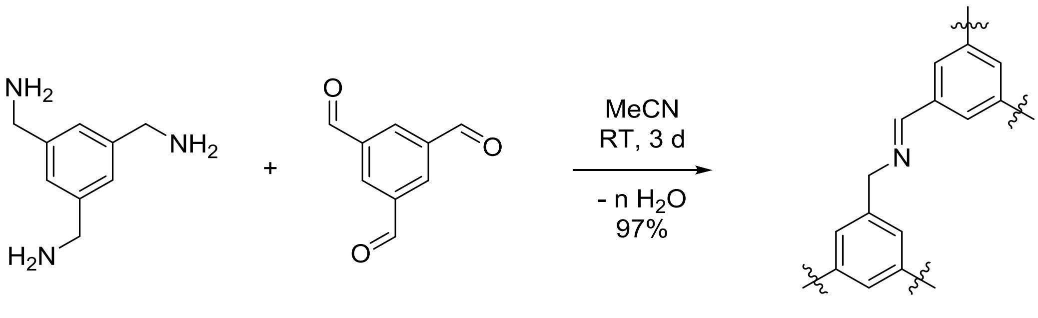
Synthesis of polymer material 3-H-Et:



1-H **2-Et** **3-H-Et-Polymer**

2,4,6-Triethylbenzene-1,3,5-tricarbaldehyde (**2-Et**) (82 mg, 330 µmol) was dissolved in MeCN (20 mL). Within 3 hours a solution of 1,3,5-trimethanamine (**2-Et**) (55 mg, 330 µmol) in MeCN (30 mL) was added dropwise under vigorous stirring at room temperature. The suspension was stirred for 3 days and the precipitate was filtered and washed with MeCN (2x10 mL). The solid residue was dried in vacuo to give 110 mg (95%) of **3-H-Et-Polymer** material as a colorless powder. M.p.: 220 °C (decomp.). ^{13}C CP MAS NMR (125 MHz): δ = 166 (-*C*HN-), 145 (-*C*-Ar), 139 (*C*-Ar), 132 (*C*-Ar), 71 (-*C*H$_2$N-), 28 (-*C*H$_2$CH$_3$), 20 (-CH$_2$*C*H$_3$) ppm. FT-IR (ATR): $\tilde{\nu}$ (cm^{-1}) = 706 m, 777 w, 858 m, 999 w, 1043 m, 1074 w, 1155 w, 1319 m, 1367, 1452 m, 1556 m, 1603 m, 1643 vs, 1688 m, 2837 w, 2872 w, 2930 w, 2966 w. Anal. calcd. for $(C_{24}H_{27}N_3)_n$·2n H_2O: C: 73.25, H: 7.94, N: 10.68, O: 8.13; found: C: 73.78, H: 7.00, N: 9.87.

Synthesis of polymer material 3-H-H:



1-H **2-H** **3-H-H-Polymer**

1,3,5-Triformylbenzene (**2-H**) (49 mg, 300 µmol) was dissolved in MeCN (10 mL). Within 3 hours a solution of 1,3,5-trimethanamine (**1-H**) (50 mg, 300 µmol) in MeCN (40 mL) was added dropwise under vigorous stirring at room temperature. The suspension was stirred for 3 days and the precipitate was filtered and washed with MeCN (25 mL). The solid residue was dried in vacuo to give 80 mg (97%) of **3-H-H-Polymer** material as a colorless powder. M.p.: 210 °C (decomp.). ^{13}C CP MAS NMR (125 MHz): δ = 165 (-*C*HN-), 141 (-*C*-Ar), 133 (*C*-Ar), 69 (-*C*H_2N-) ppm. FT-IR (ATR): ṽ (cm^{-1}) = 687 s, 768 w, 793 vw, 858 m, 879 m, 953 w, 995 w, 1040 w, 1146 m, 1225 w, 1252 w, 1288 w, 1319 m, 1366 w, 1443 m, 1601 m, 1639 vs, 1697 m, 2839 w. Anal. calcd. for $(C_{18}H_{15}N_3)_n$·2n H_2O: C: 69.88, H: 6.19, N: 13.58, O: 10.34; found: C: 70.23, H: 6.16, N: 13.44.

3 Exchange experiments

Mixing 3-Et-H and 3-Et-Et

3-Et-H (4 mg, 3 µmol) and **3-Et-Et** (5 mg, 3 µmol) were suspended in 20 mL MeCN. The suspension was stirred at RT for 3 days. The solvent was removed in vacuo and residue analysed via ^{1}H NMR and MALDI-MS: no exchange of buildings blocks could be detected. Afterwards, 20 mL MeCN and 1 mol% TFA was added. After 3 hours and 4 days the suspension was analysed via ^{1}H-NMR spectroscopy. Again, no exchange of buildings blocks could be detected, a slow decomposition of **3-Et-H** was observed instead. Adding 10 mol% of TFA leads to a complete decomposition of **3-Et-H** after 2 days, whereby **3-Et-Et** is still stable. Adding 1 equivalent of TFA results in an instant decomposition of **3-Et-H** and **3-Et-Et**. An insoluble precipitate was formed.

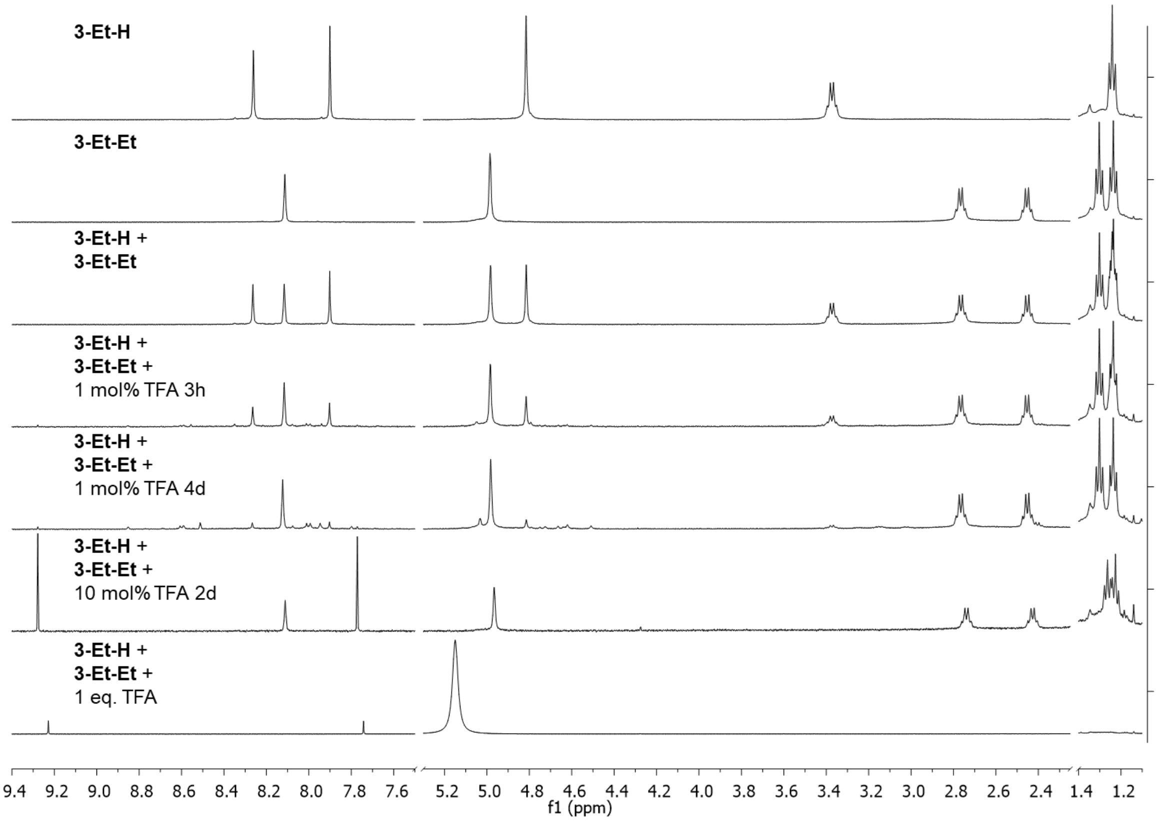


Figure S1: ^{1}H NMR spectra (500 MHz, PhMe-d_8) of the exchange experiments between compound **3-Et-H** and **3-Et-Et**.

Scrambled Cages

1,3,5-Triformylbenzene (**2-H**) (3.2 mg, 20 µmol) and 2,4,6-Triethylbenzene-1,3,5-tricarbaldehyde (**2-Et**) (5 mg, 20 µmol) were dissolved in MeCN (1 mL). Within 3 hours a solution of 2,4,6-triethylbenzene-1,3,5-trimethanamine (**1-Et**) (10 mg, 40 µmol) in MeCN (6 mL) was added dropwise under vigorous stirring at room temperature. The suspension was stirred for 3 days and the precipitate was filtered and washed with MeCN (20 mL). The solid residue was extracted with DCM (50 mL) and the solvent of the extract removed in vacuo. The resulting product was analysed by MALDI-MS revealing that mixed cages **3-Et-H**, **3-Et-(H,H,H,Et)**, **3-Et-(H,H,Et,Et)**, **3-Et-(H,Et,Et,Et)** and **3-Et-Et** were formed.

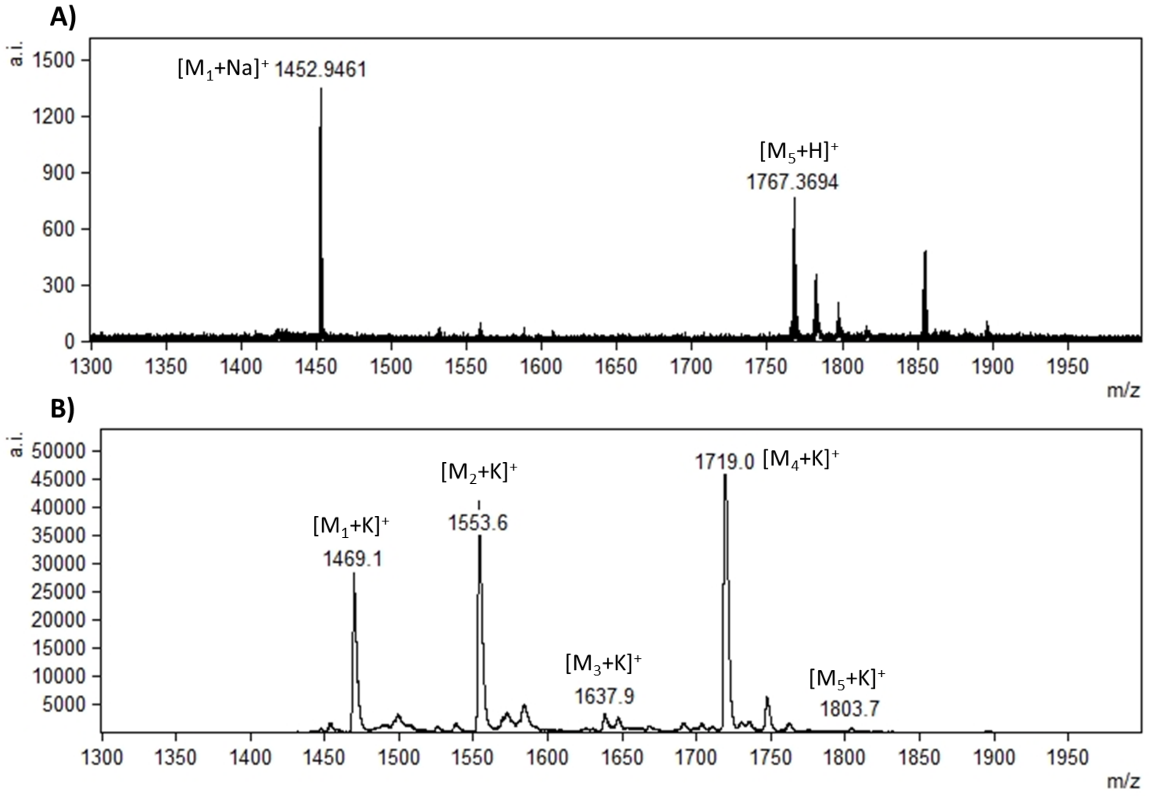


Figure S2: MALDI-MS spectra of exchange experiments. (A) MALDI-MS spectrum of **3-Et-H** (M_1) and **3-Et-Et** (M_5) after stirring in MeCN for 3 days at RT. (B) MALDI-MS spectrum of a mixture of **3-Et-H** (M_1), **3-Et-(H,H,H,Et)** (M_2), **3-Et-(H,H,Et,Et)** (M_3), **3-Et-(H,Et,Et,Et)** (M_4) and **3-Et-Et** (M_5).

Mixing 1-H and 3-Et-Et

1,3,5-Triformylbenzene (**2-H**) (1 mg, 6 µmol) and cage **3-Et-Et** (4 mg, 2 µmol) were suspended in MeCN (4 mL). The suspension was stirred for 3 days at RT. The solvent was removed in vacuo and the residue analysed by ^{1}H NMR spectroscopy.

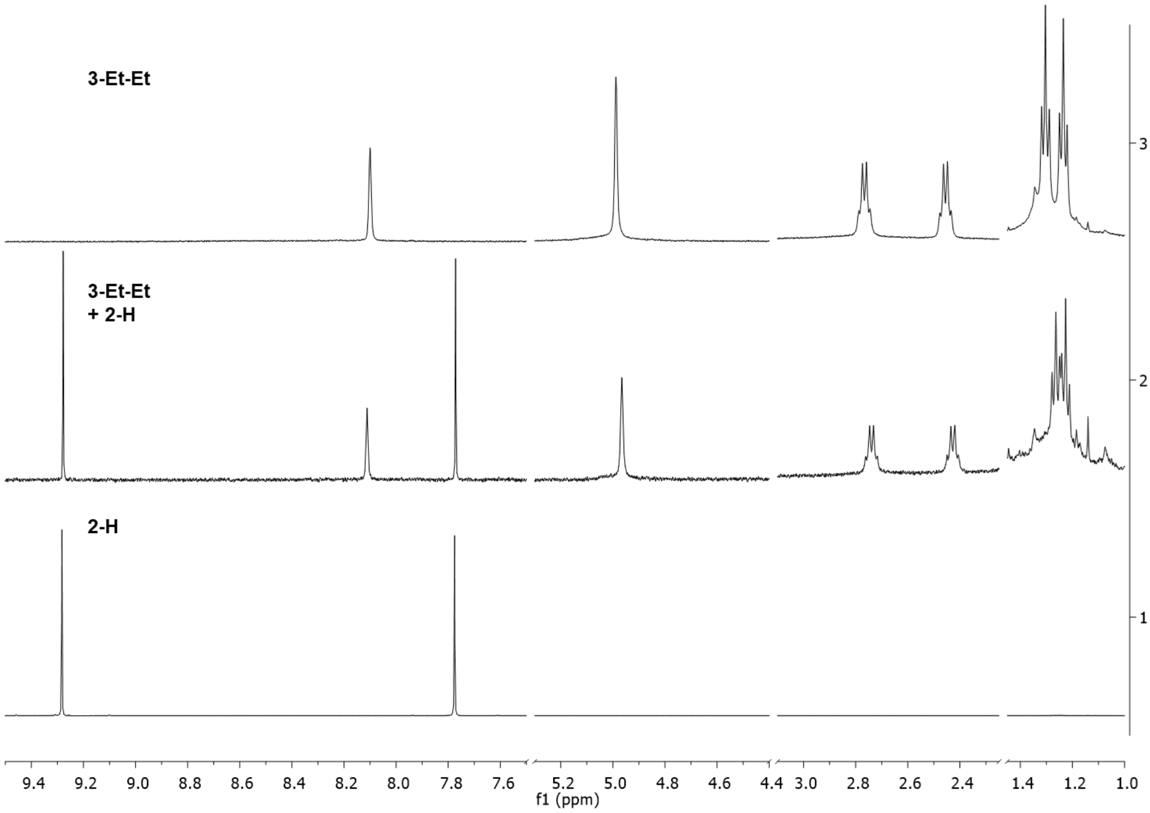


Figure S3: ^{1}H NMR spectra (500 MHz, PhMe-d_8) of the exchange experiment between compound **2-H** and **3-Et-Et**. No exchange of buildings blocks could be detected.

4 MM2 calculations

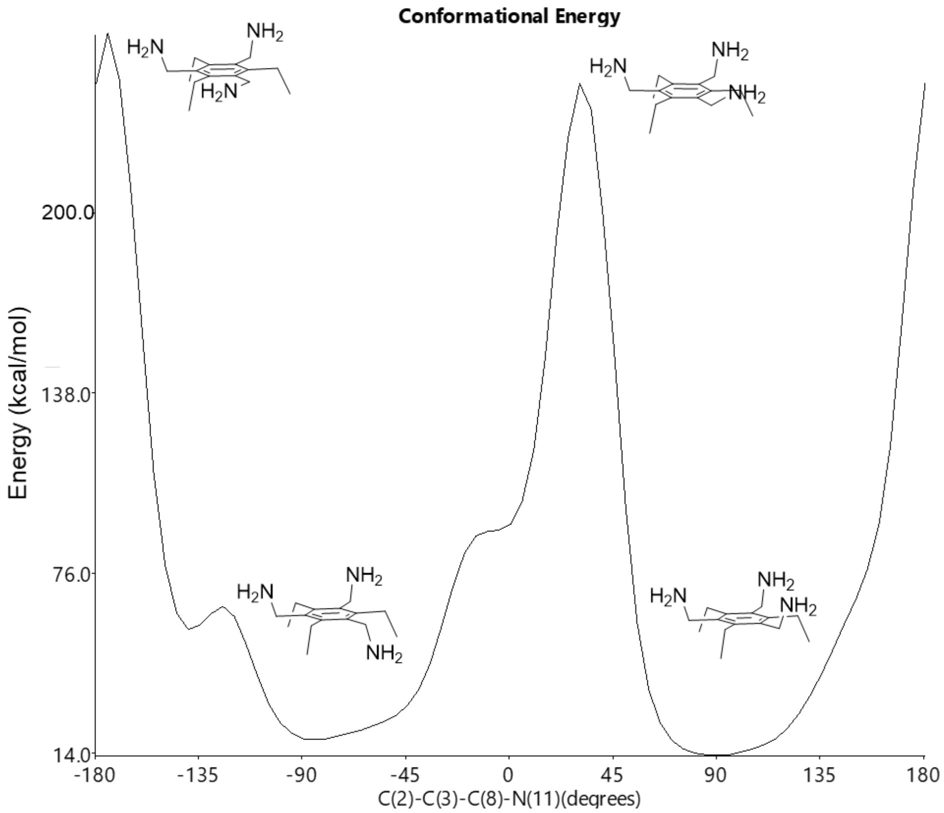


Figure S4: Rotational energy around the C_{SP2}-C_{SP3}-bond of a methylamine substituent of **1-Et** (MM2 calculation).

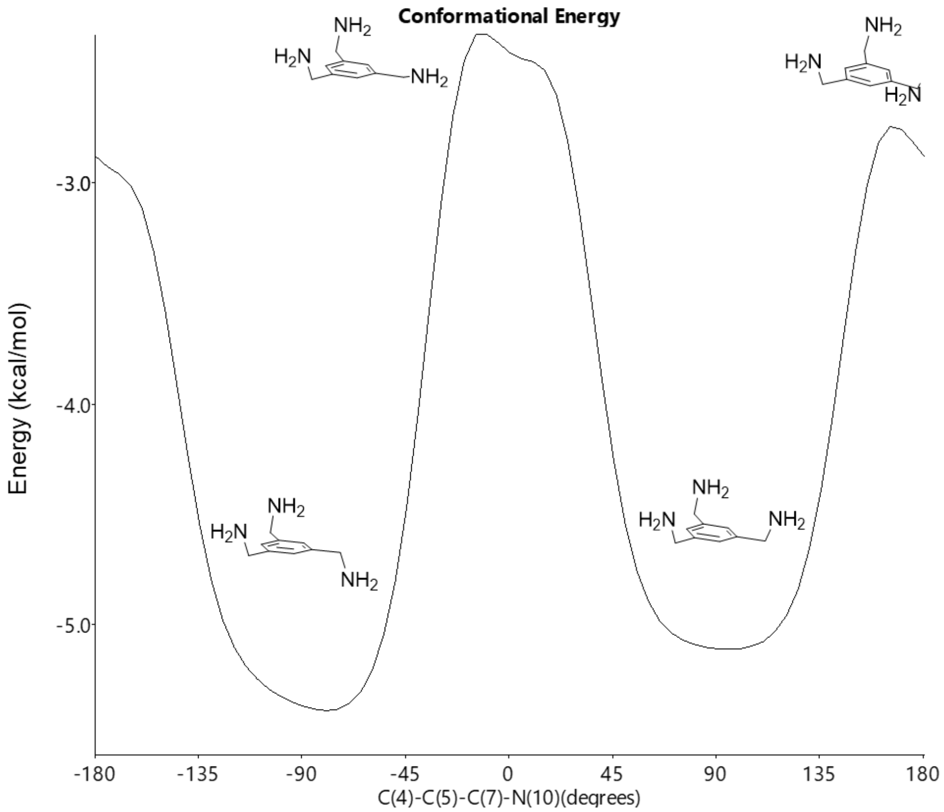


Figure S5: Rotational energy around the C_{SP2}-C_{SP3}-bond of a methylamine substituent of **1-H** (MM2 calculation).

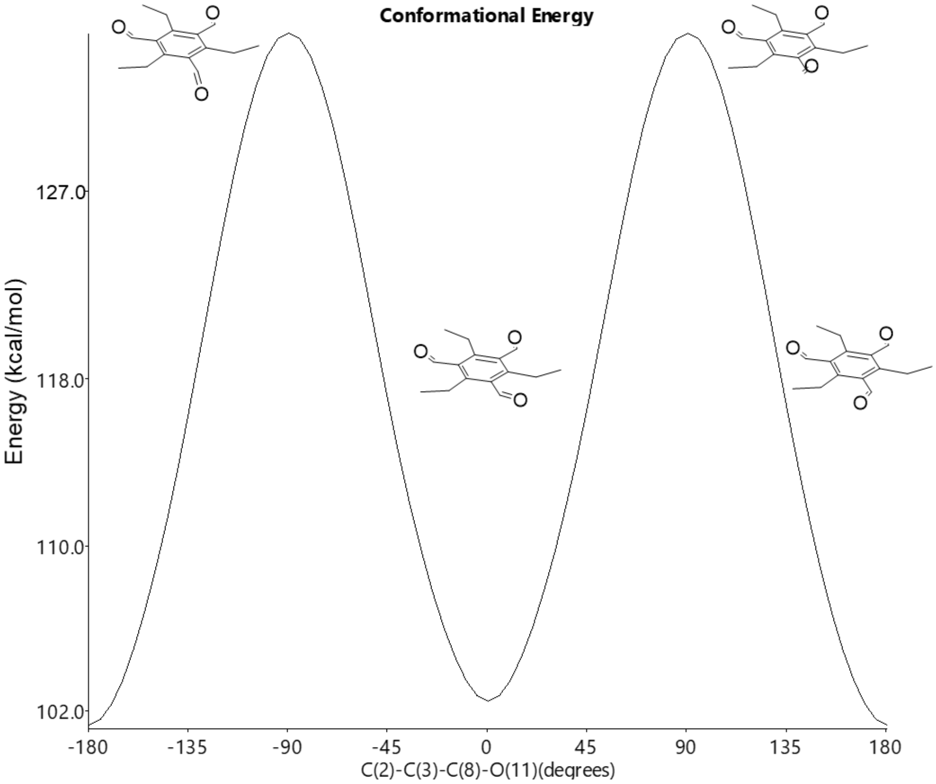


Figure S6: Rotational energy around the C$_{SP2}$-C$_{SP3}$-bond of a methylamine substituent of **2-Et** (MM2 calculation).

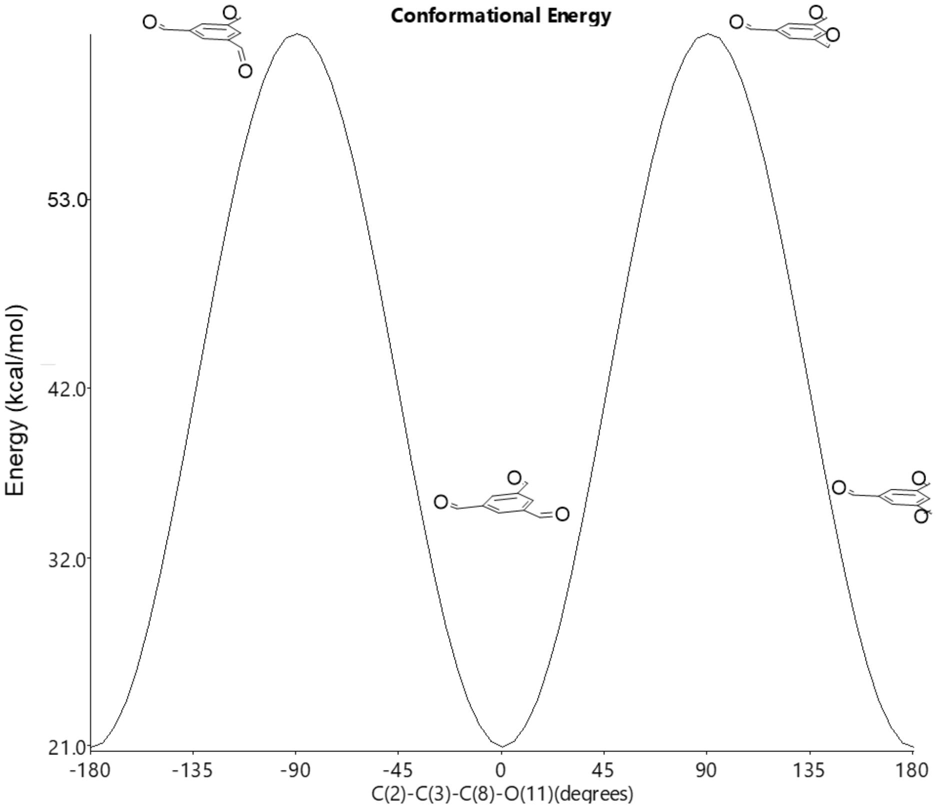


Figure S7: Rotational energy around the C$_{SP2}$-C$_{SP3}$-bond of a methylamine substituent of **2-H** (MM2 calculation).

5 NMR analytics

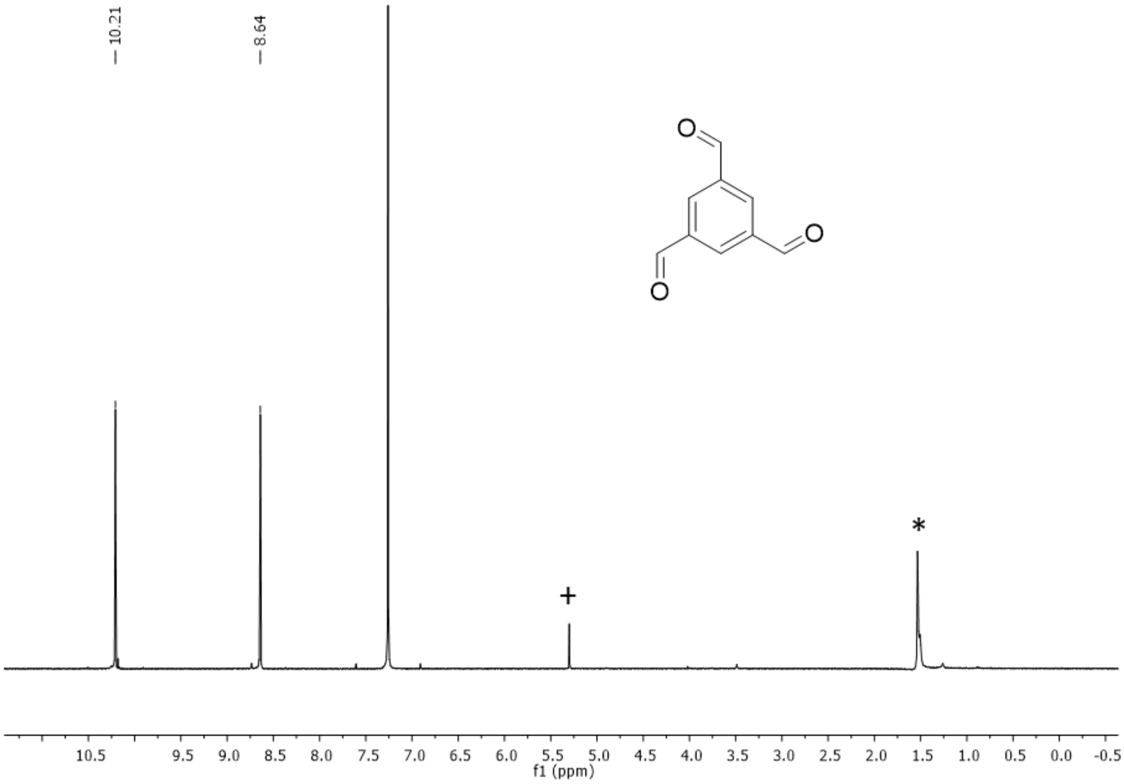


Figure S8: ^{1}H NMR spectrum (300 MHz, $CDCl_3$) of 1,3,5-triformylbenzene (**2-H**). * H_2O, $^+$ DCM.

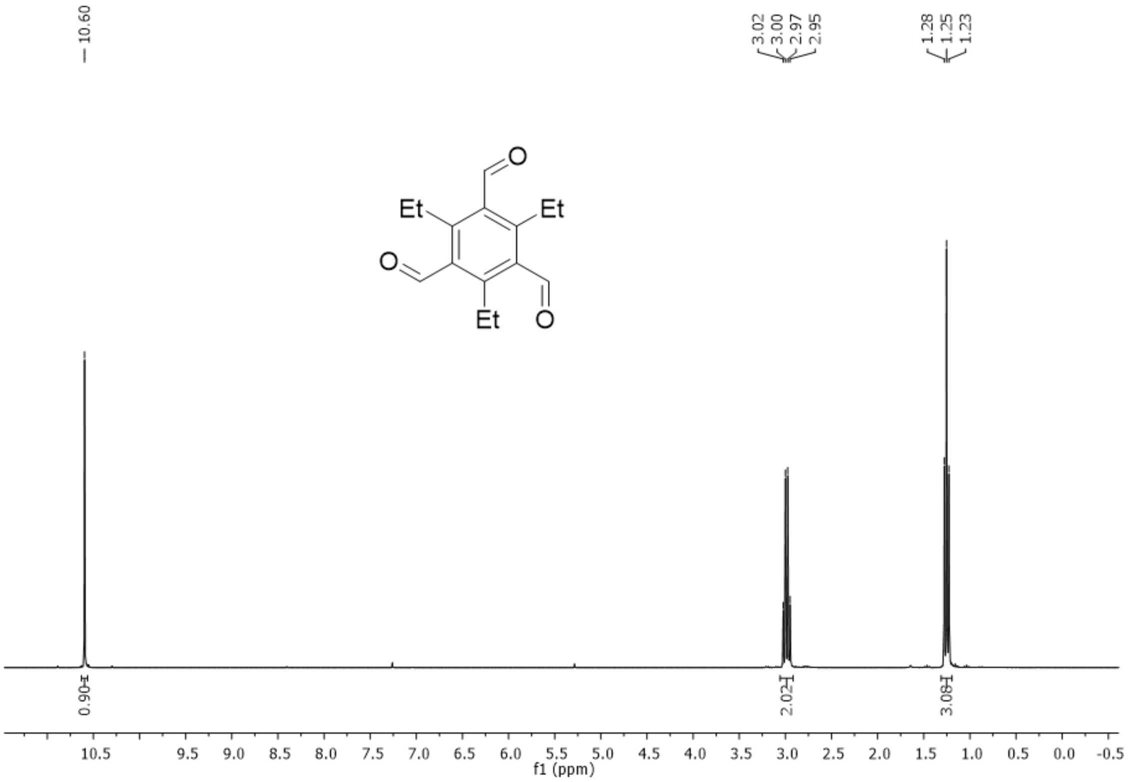


Figure S9: ^{1}H NMR spectrum (300 MHz, $CDCl_3$) of 2,4,6-triethylbenzene-1,3,5-tricarbaldehyde **(2-Et)**.

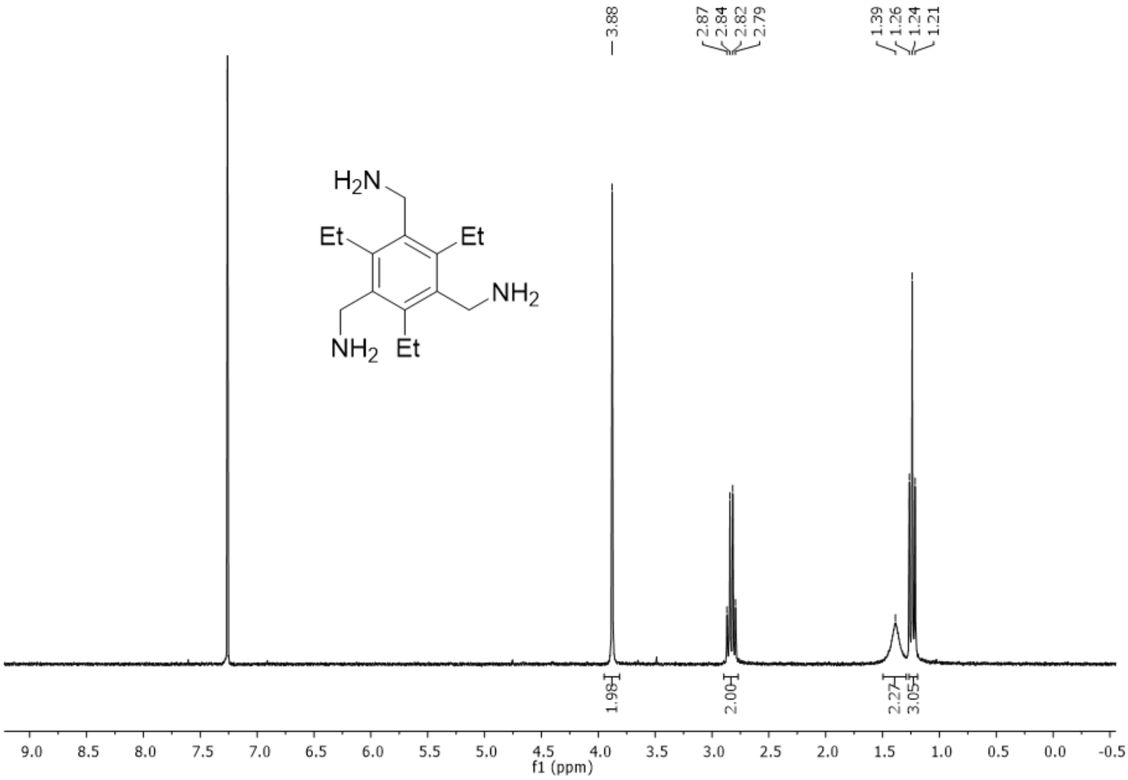


Figure S10: ^{1}H NMR spectrum (300 MHz, $CDCl_3$) of 1,3,5-tris(aminomethyl)-2,4,6-triethylbenzene (**1-Et**).

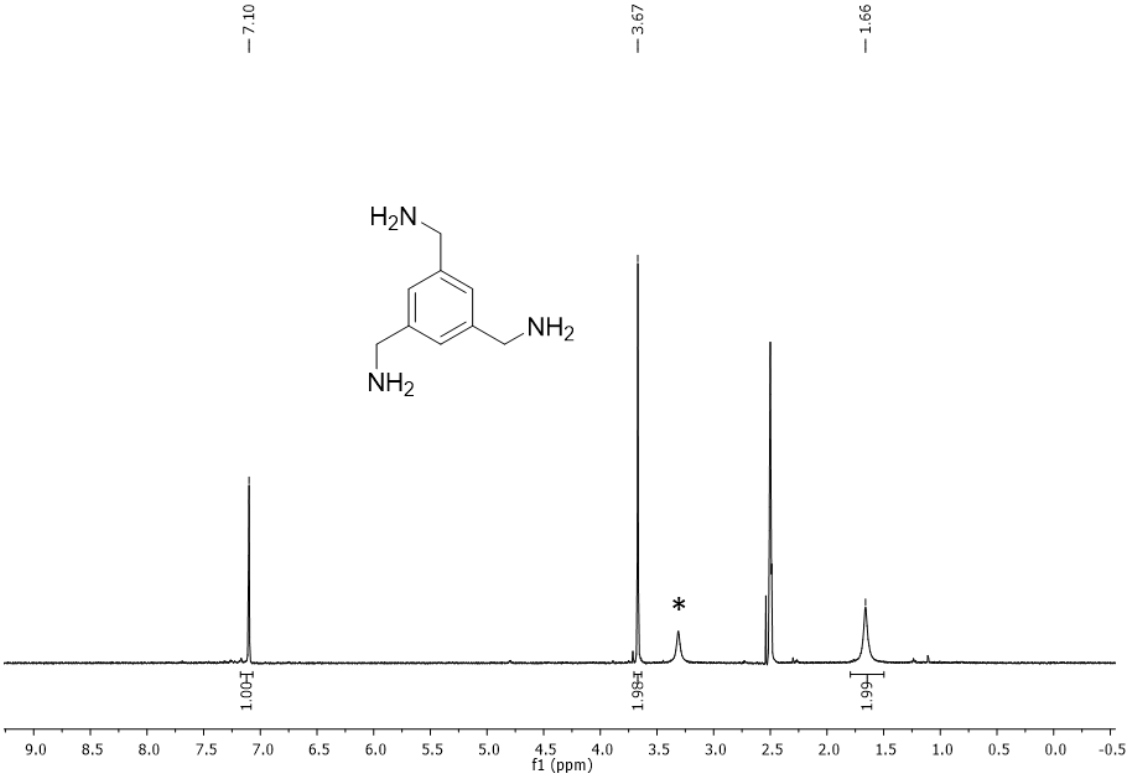


Figure S11: ^{1}H NMR spectrum (300 MHz, DMSO-d_6) of 1,3,5-tris(aminomethyl)-benzene **(1-H)**. * H_2O.

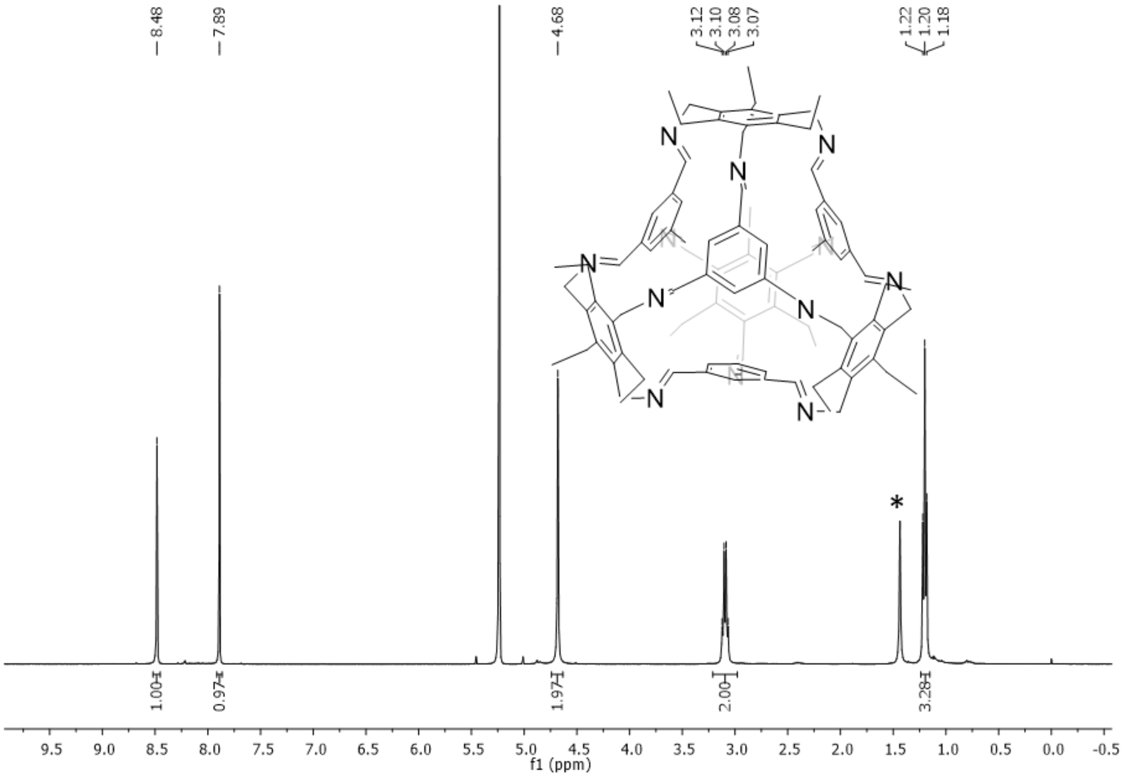


Figure S12: ^{1}H NMR spectrum (400 MHz, CD_2Cl_2) of cage compound **3-Et-H**. * H_2O.

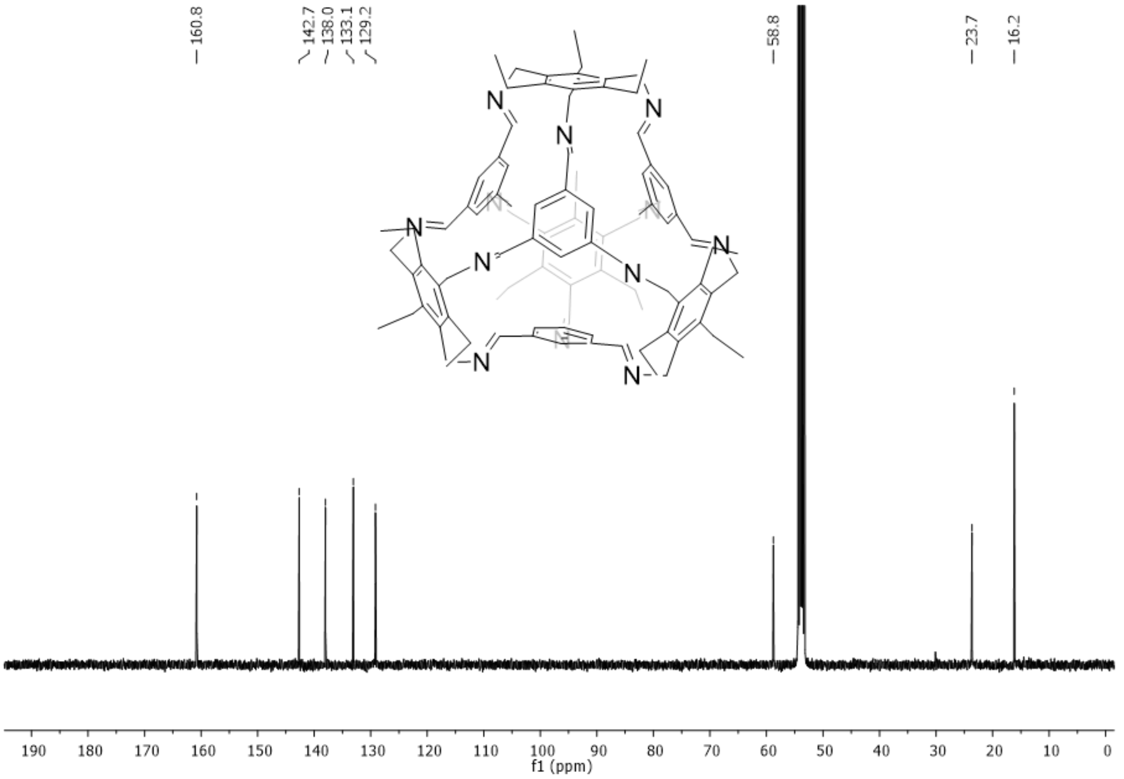


Figure S13: ^{13}C NMR spectrum (100 MHz, CD_2Cl_2) of cage compound **3-Et-H**.

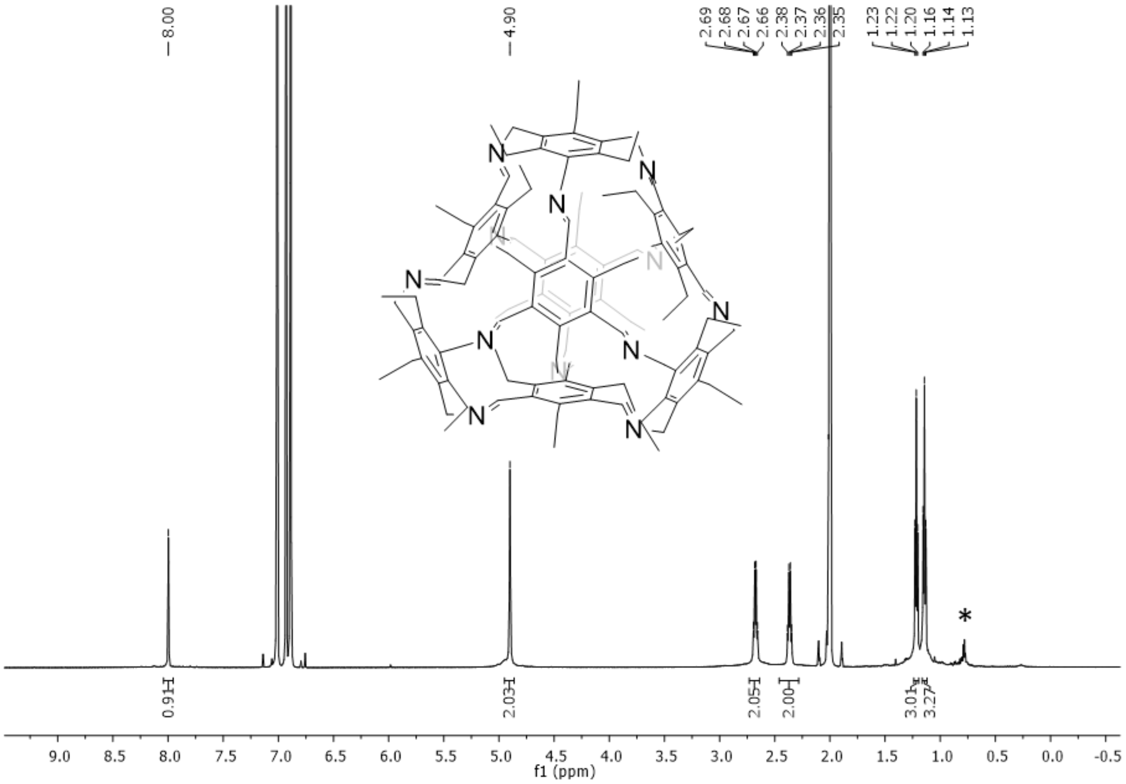


Figure S14: ^{1}H NMR spectrum (600 MHz, PhMe-d_8) of cage compound **3-Et-Et**. * H-grease from deuterated solvent.

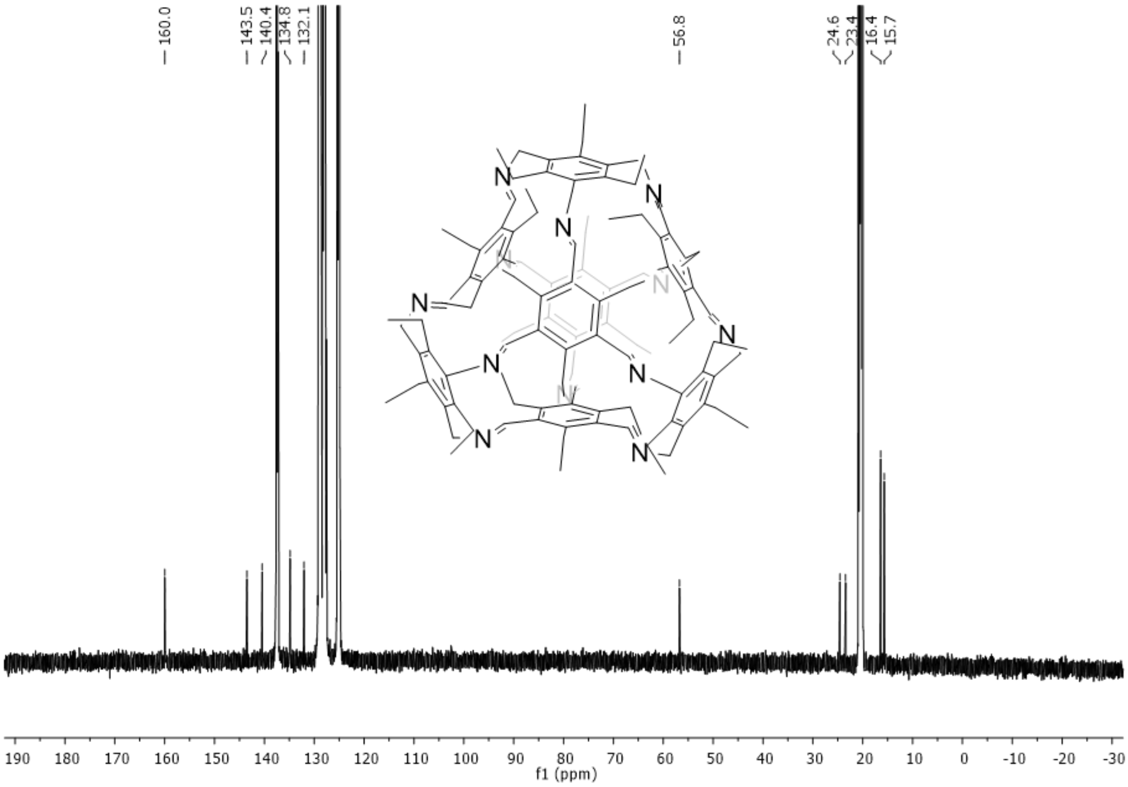


Figure S15: ^{13}C NMR spectrum (150 MHz, PhMe-d_8) of cage ompound **3-Et-Et**.

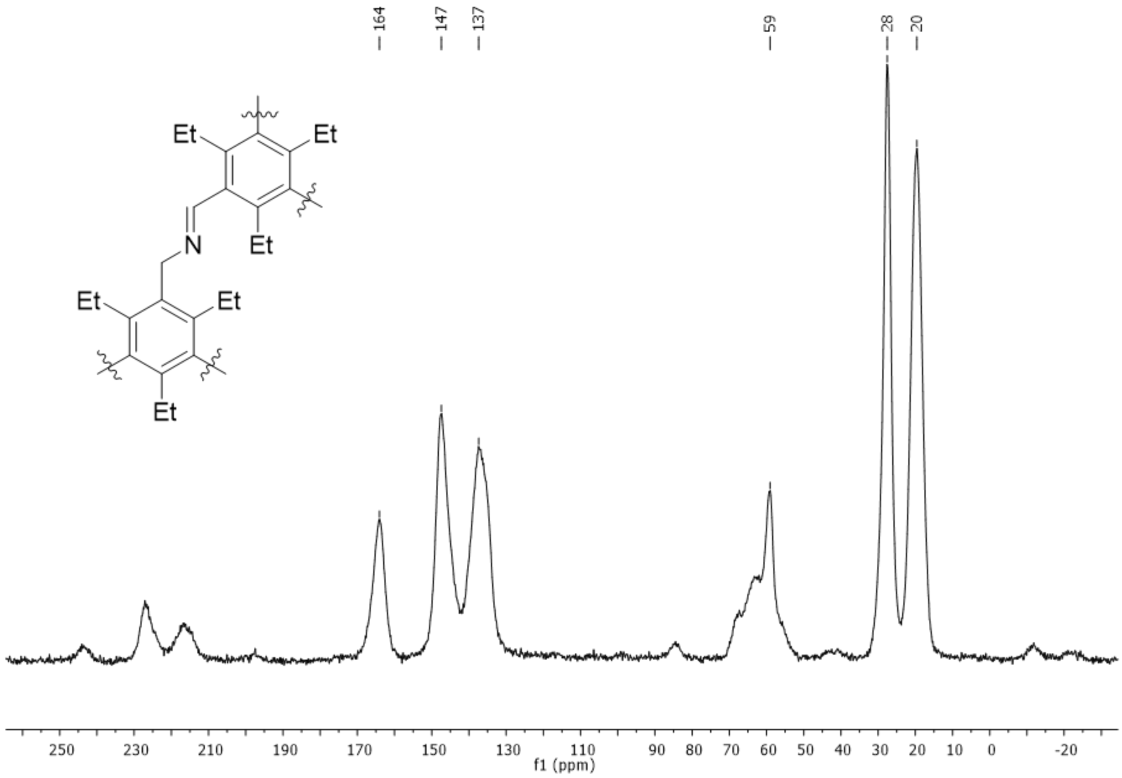


Figure S16: ^{13}C CP MAS NMR spectrum (125 MHz) of **3-Et-Et-Polymer**.

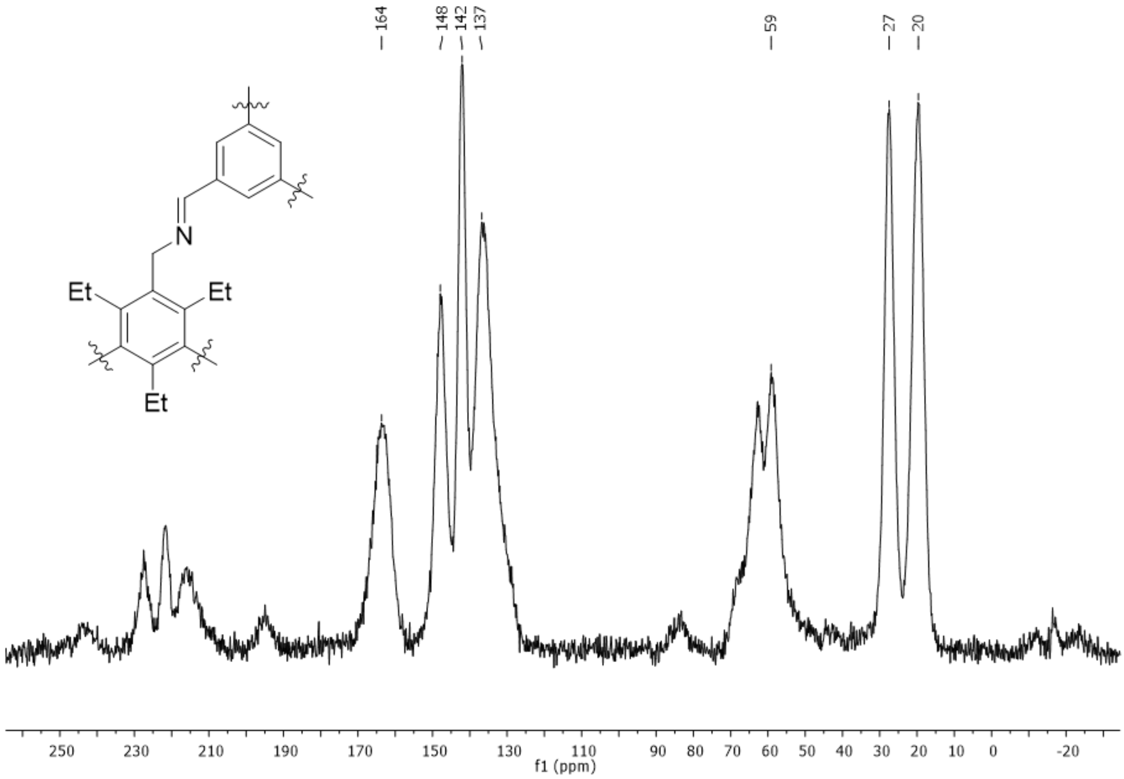


Figure S17: ^{13}C CP MAS NMR spectrum (125 MHz) of **3-Et-H-Polymer**.

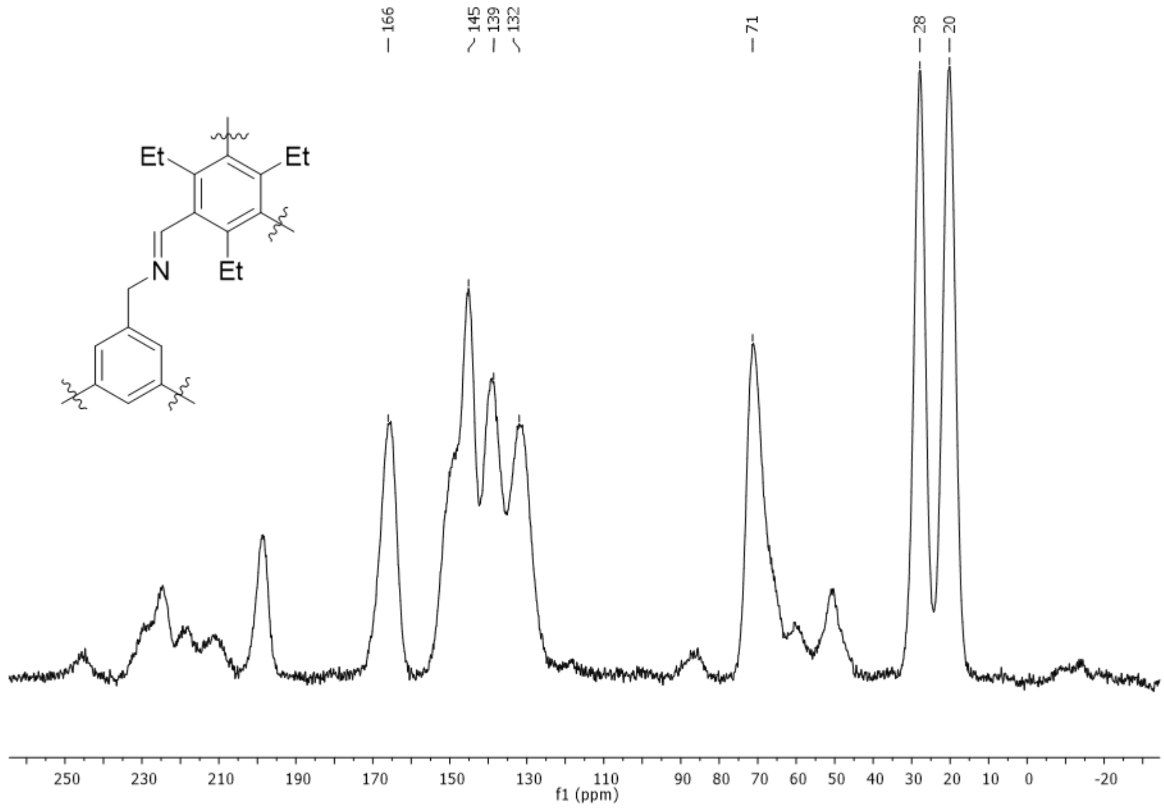


Figure S18: ^{13}C CP MAS NMR spectrum (125 MHz) of **3-H-Et-Polymer**.

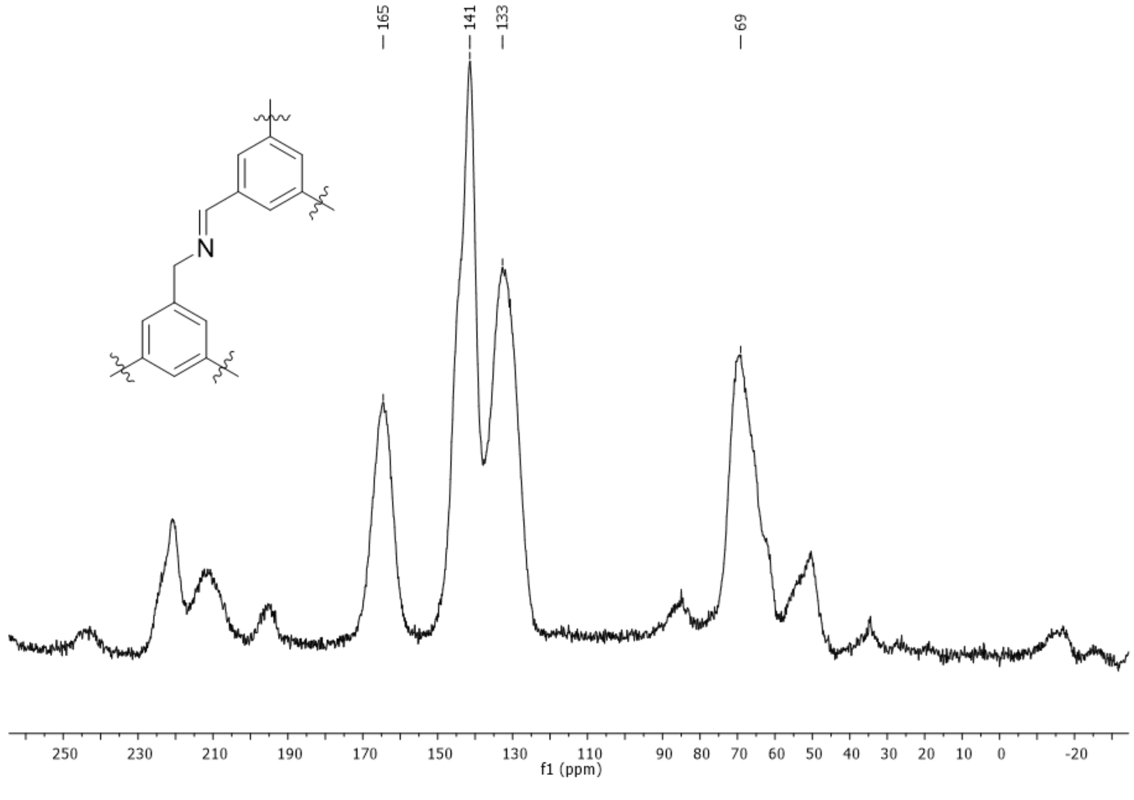


Figure S19: ^{13}C CP MAS NMR spectrum (125 MHz) of **3-H-H-Polymer**.

6 DOSY experiments

DOSY NMR experiments were recorded at 298 K and calibrated using known self-diffusion values for the solvents used (D_{solv}).[S8] The hydrodynamic radii were estimated using the semi-empirical modification of the Stokes-Einstein relation proposed by Chen and Chen.[S9] This equation was solved for r_s using values of r_{solv} and η from the literature.[S10]

$$D = \frac{\mathrm{k}_B\mathrm{T}}{\left(\frac{6}{1 + 0.695\left(\frac{r_{solv}}{r_s}\right)^{2.234}}\right)\pi\eta r_s}$$

D is the measured diffusion coefficient ($m^2 \cdot s^{-1}$)

k_B is Boltzmann constant ($1.3806485 \cdot 10\ m^2 \cdot kg \cdot s^{-2} \cdot K^{-1}$)

T is the temperature (K)

r_{solv} is the hydrodynamic radius of the solvent (m)

r_s is the hydrodynamic radius of the analyte (m)

η is the viscosity of the solvent at temperature T ($kg \cdot m^{-1} \cdot s^{-1}$)

Table S1: Estimation of the hydrodynamic radius of **3-Et-H**-Cage and **3-Et-Et**-Cage (r_h) in C_6D_6 as solvent using parameters from the literature and diffusion coefficients measured by DOSY NMR.

Compound	**T [K]**	**$D_{solv} \cdot 10^{-9}$ [$m^2 \cdot s^{-1}$]**	**r_{solv} [nm]**	**$\eta \cdot 10^{-3}$ [$kg \cdot m^{-1} \cdot s^{-1}$]**	**$D \cdot 10^{-10}$ [$m^2 \cdot s^{-1}$]**	**r_h [nm]**
3-Et-H-Cage	298	2.18	0.270	0.603	4.17	0.87
3-Et-Et-Cage	298	2.18	0.270	0.603	4.07	0.89

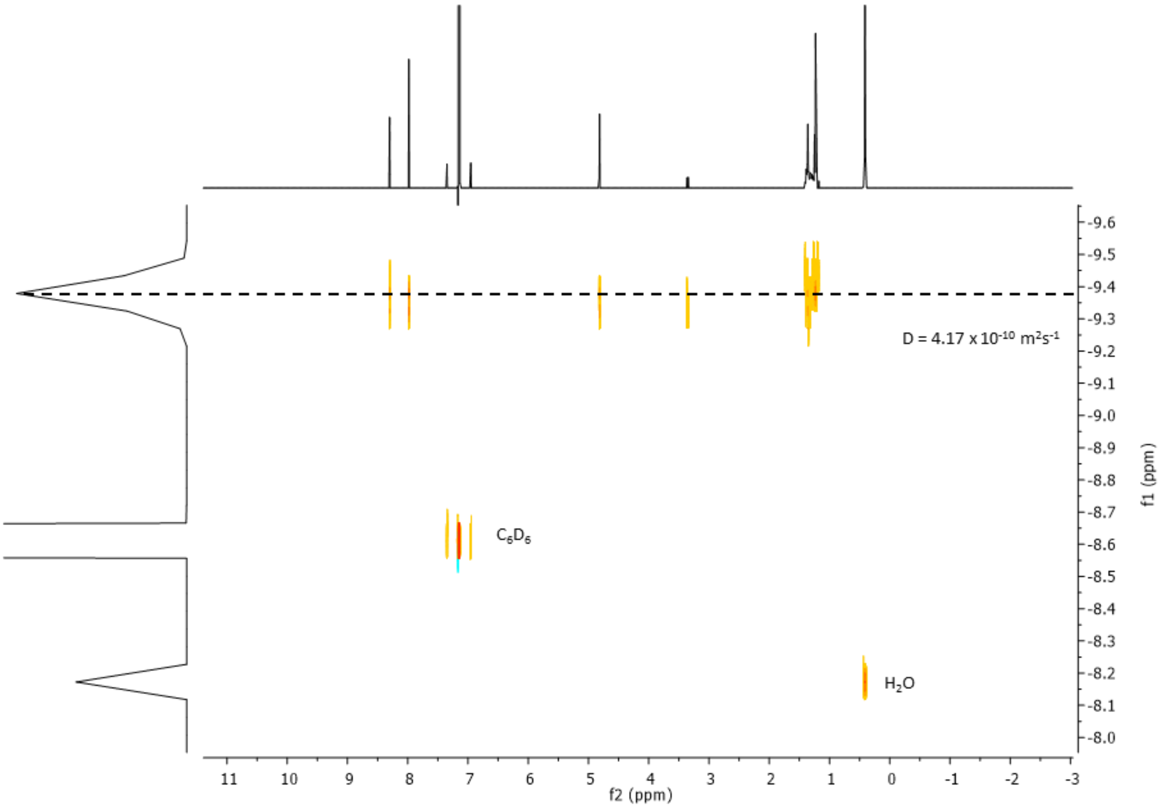


Figure S20: DOSY NMR spectrum (400 MHz, C_6D_6) of cage compound **3-Et-H**.

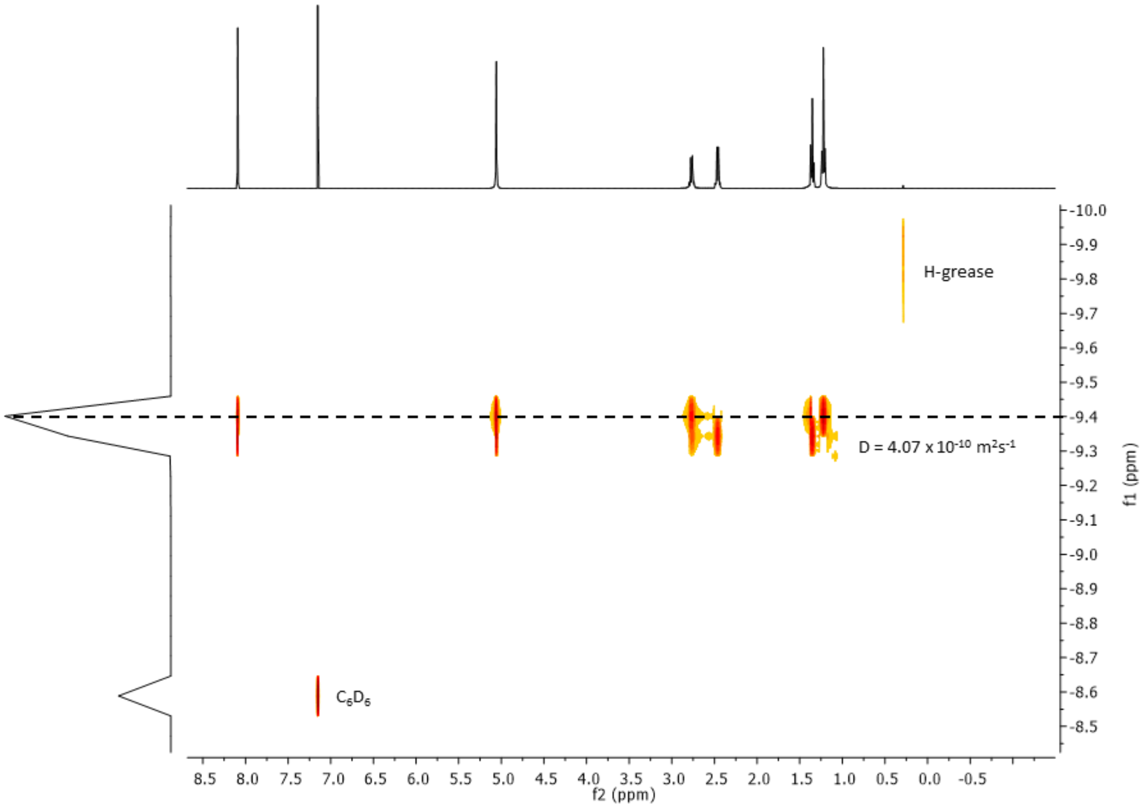


Figure S21: DOSY NMR spectrum (400 MHz, C_6D_6) of cage compound **3-Et-Et**.

7 Mass spectra

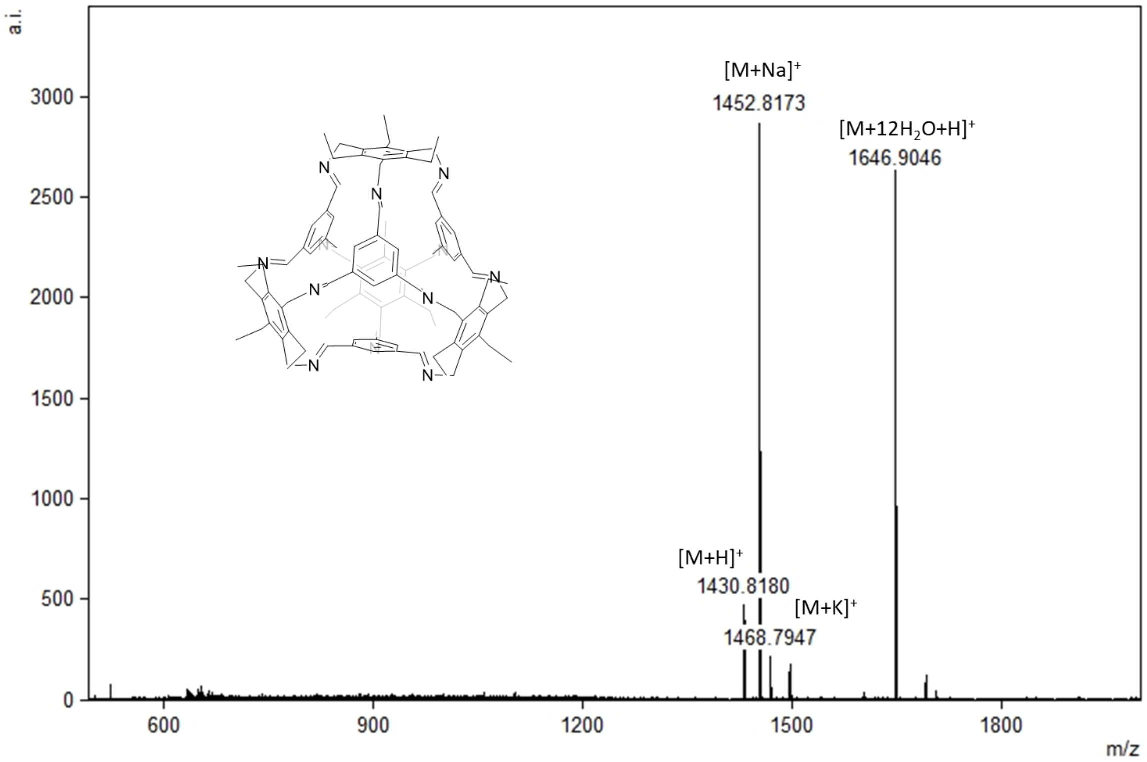


Figure S22: MALDI-TOF MS (DCTB) of compound **3-Et-H**.

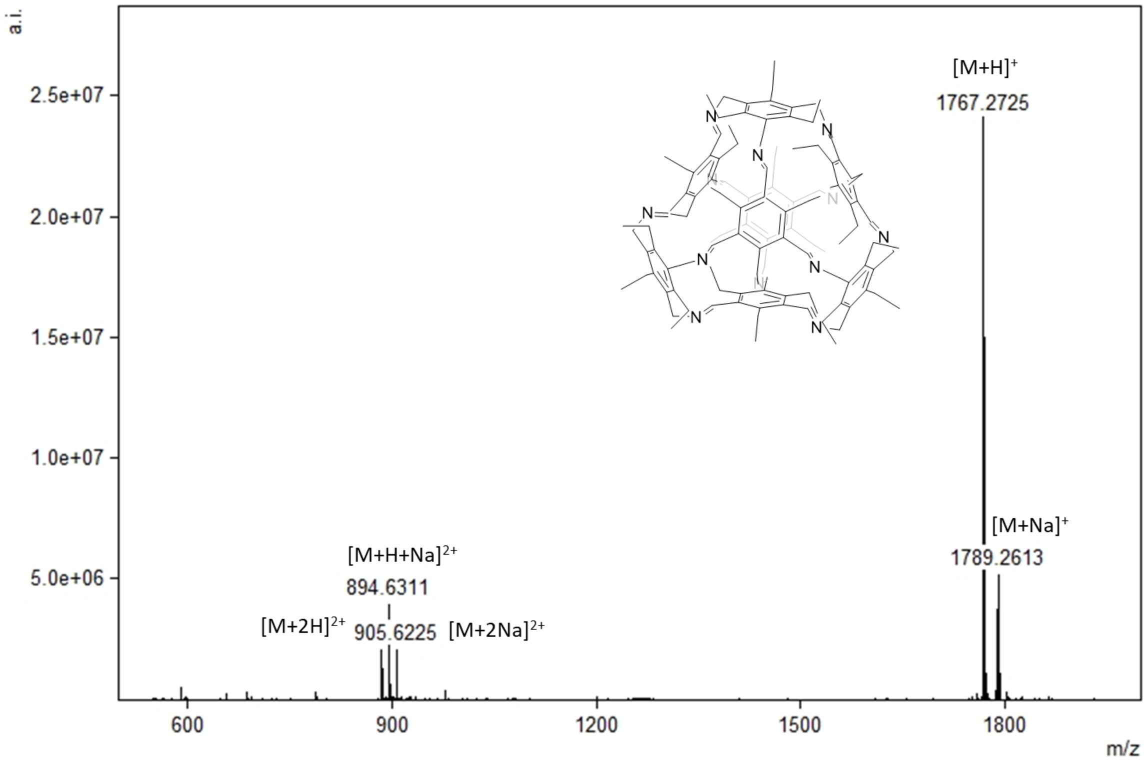


Figure S23: ESI-MS of compound **3-Et-Et** in DCM/MeOH.

8 Infrared spectra

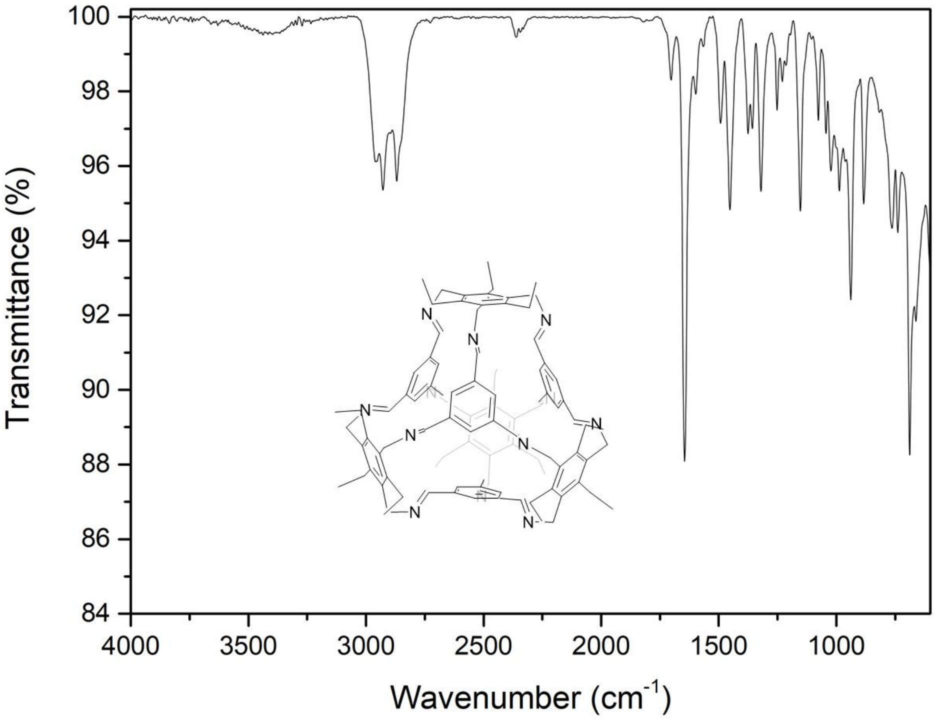


Figure S24: IR spectrum (ATR) of compund **3-Et-H**.

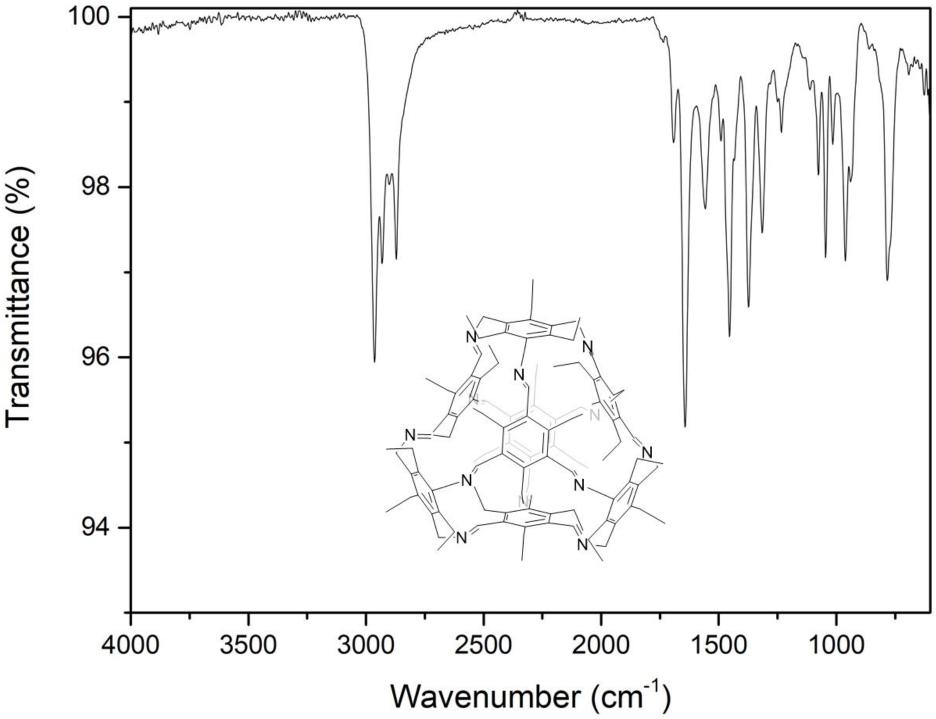


Figure S25: IR spectrum (ATR) of compund **3-Et-Et**.

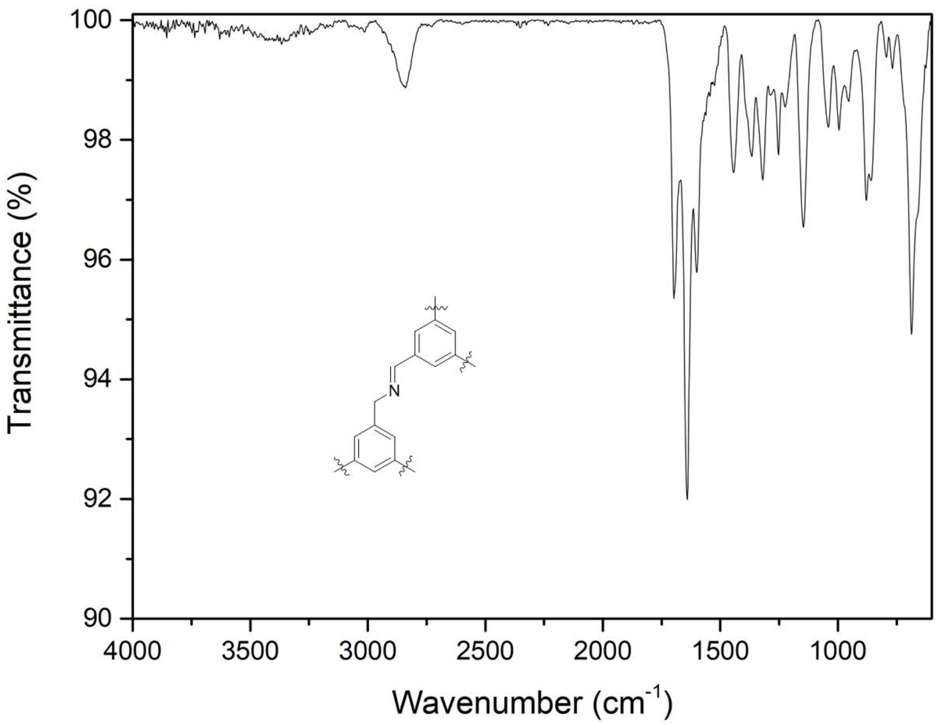


Figure S26: IR spectrum (ATR) of compund **3-H-H-Polymer**.

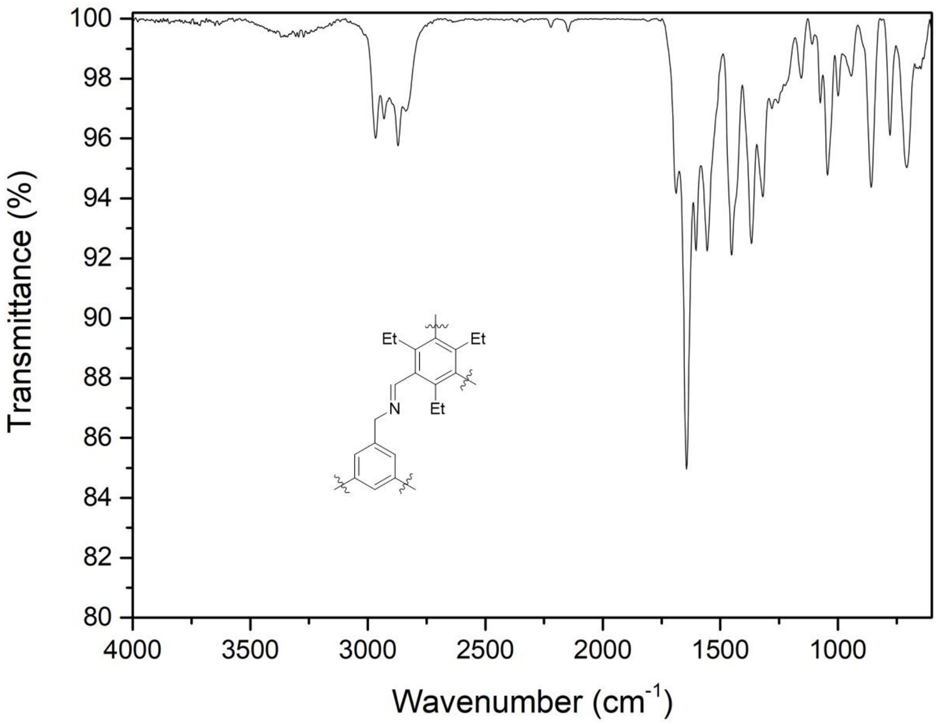


Figure S27: IR spectrum (ATR) of compund **3-H-Et-Polymer**.

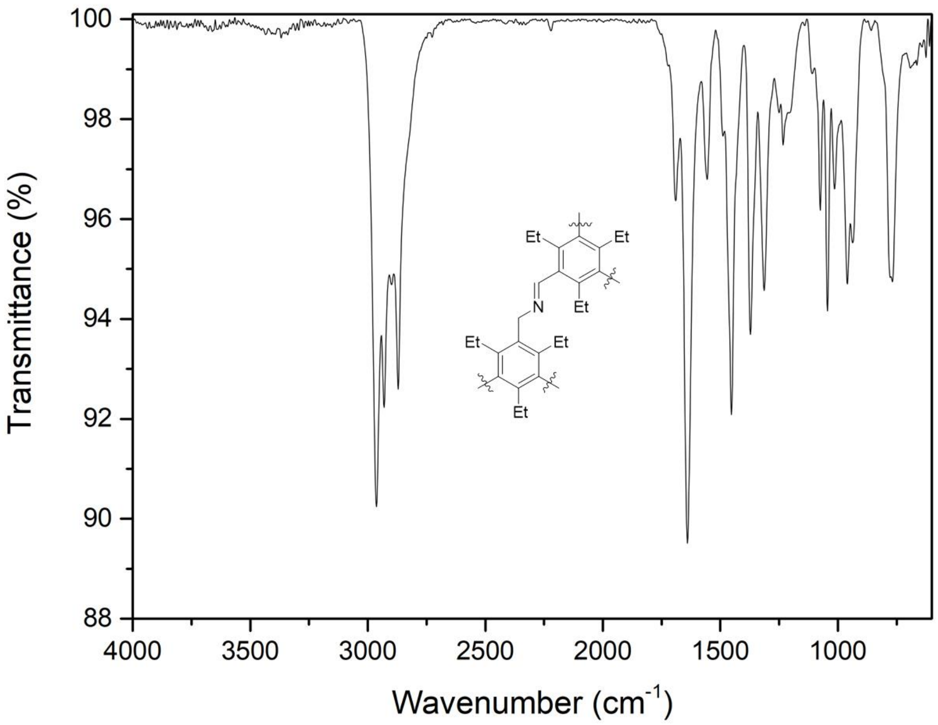


Figure S28: IR spectrum (ATR) of compund **3-Et-Et-Polymer**.

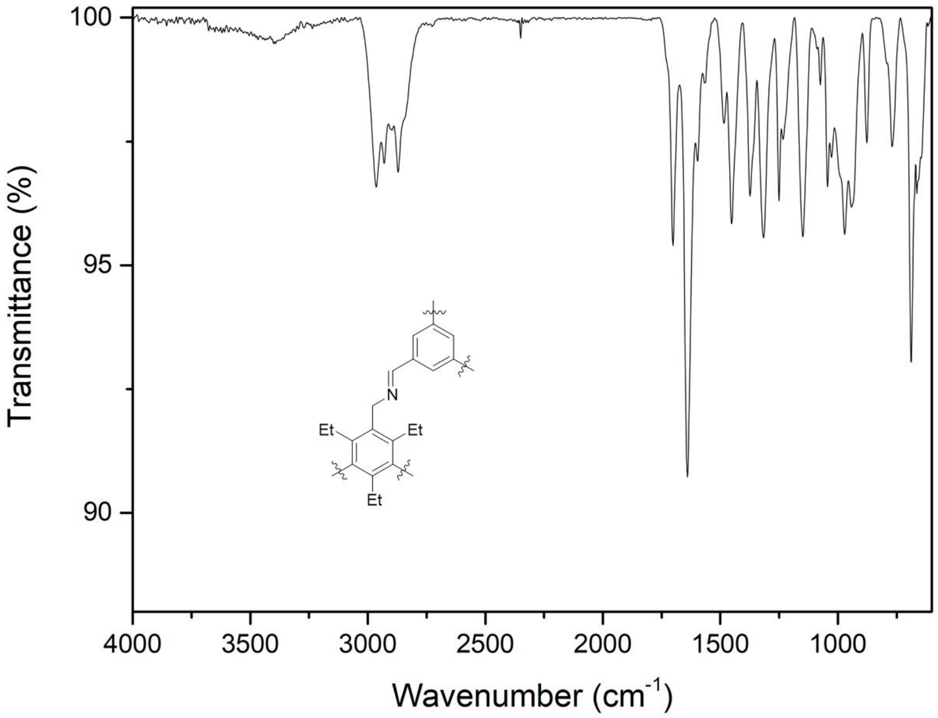


Figure S29: IR spectrum (ATR) of compund **3-Et-H-Polymer**.

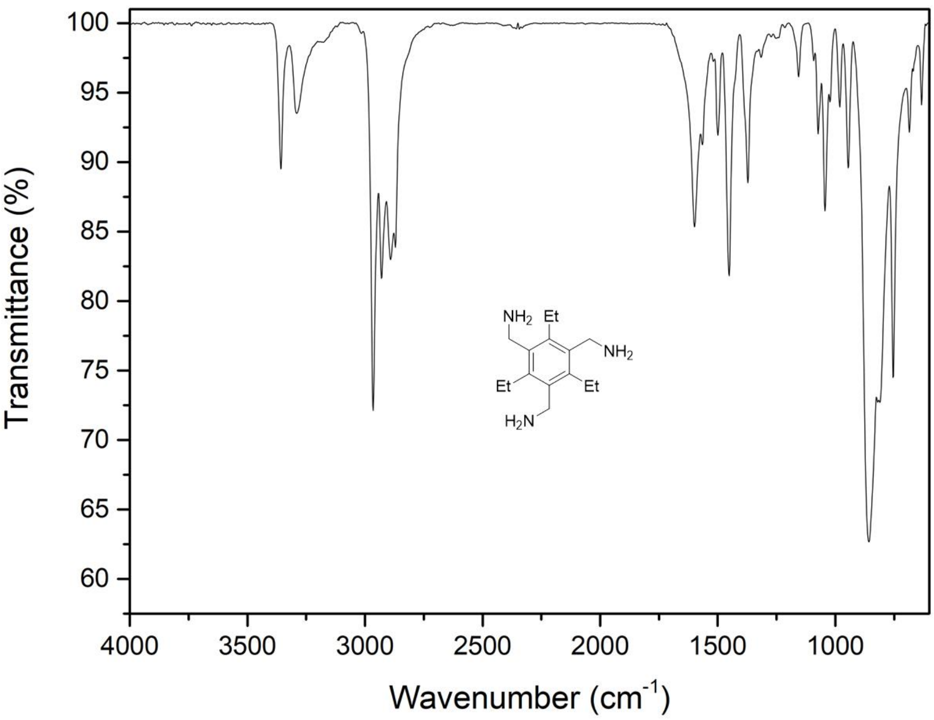


Figure S30: IR spectrum (ATR) of compund **1-Et**.

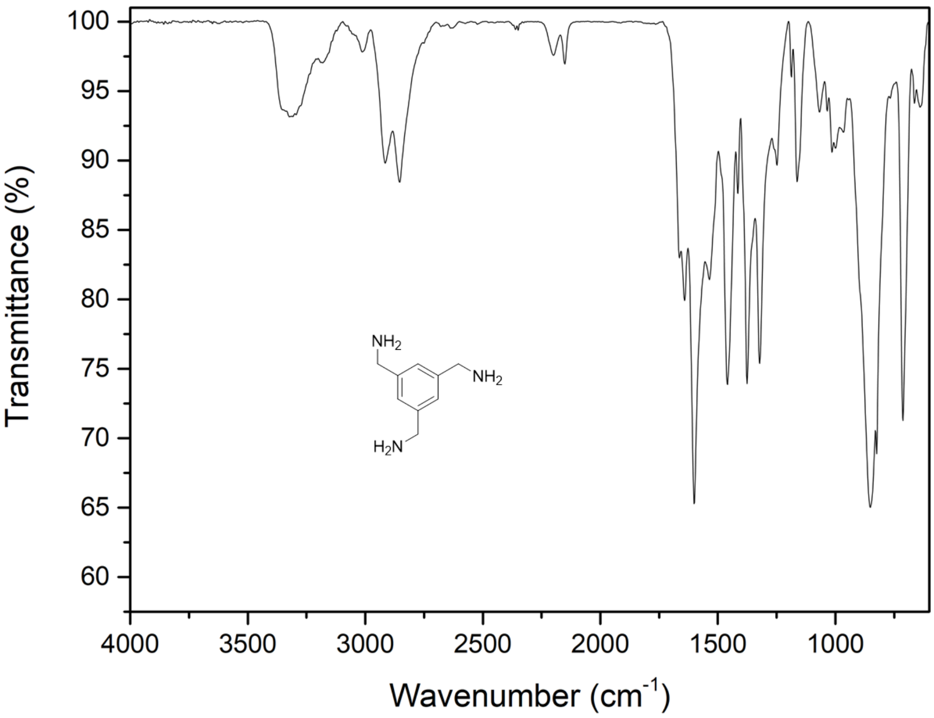


Figure S31: IR spectrum (ATR) of compund **1-H**.

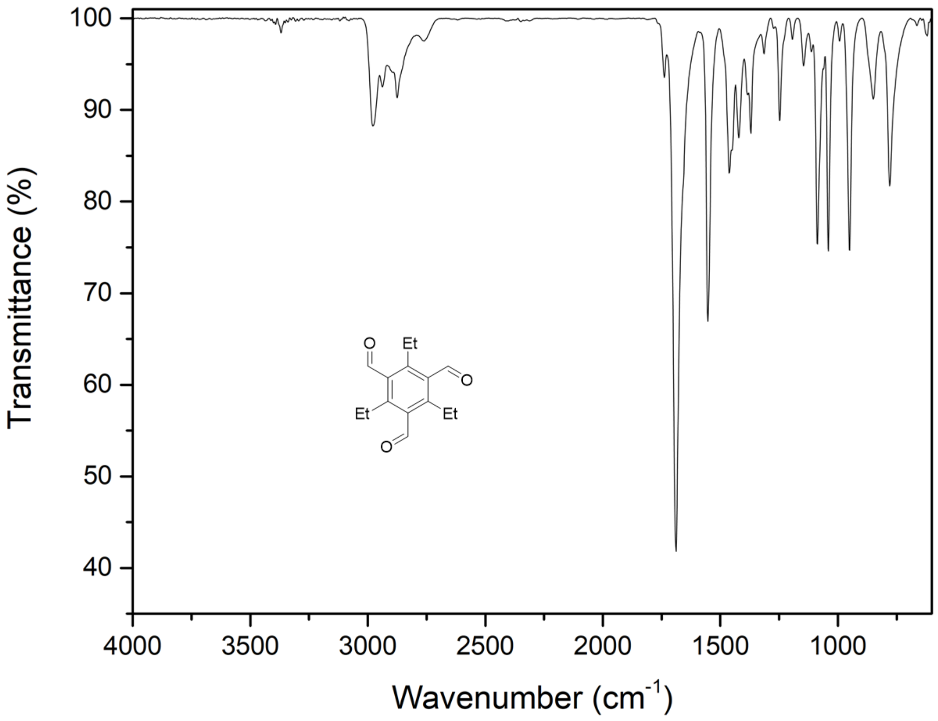


Figure S32: IR spectrum (ATR) of compund **2-Et**.

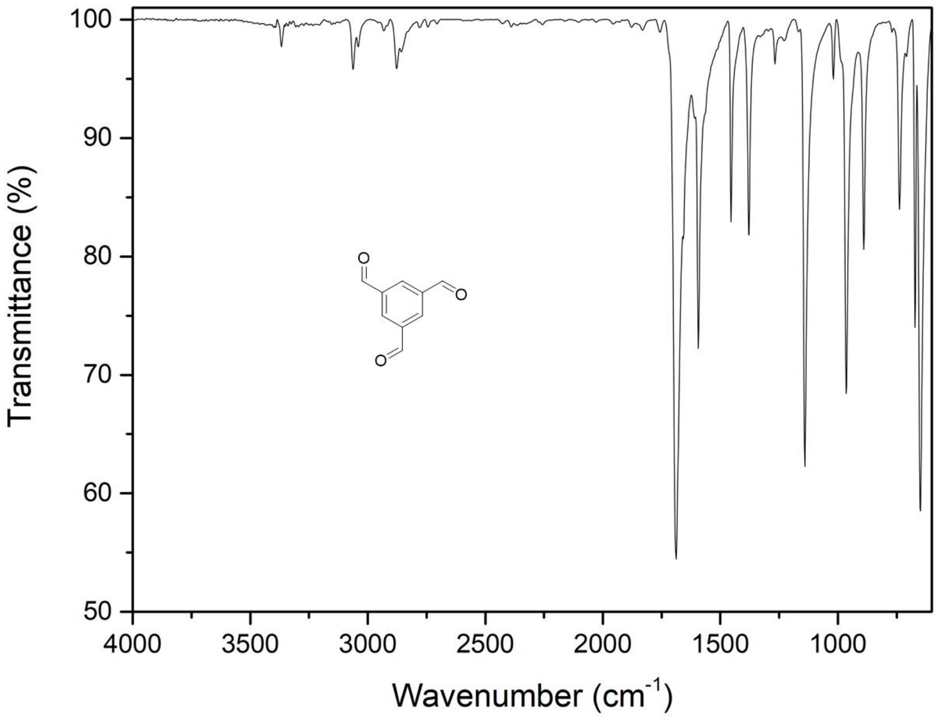


Figure S33: IR spectrum (ATR) of compund **2-H**.

9 Thermogravimetric analysis

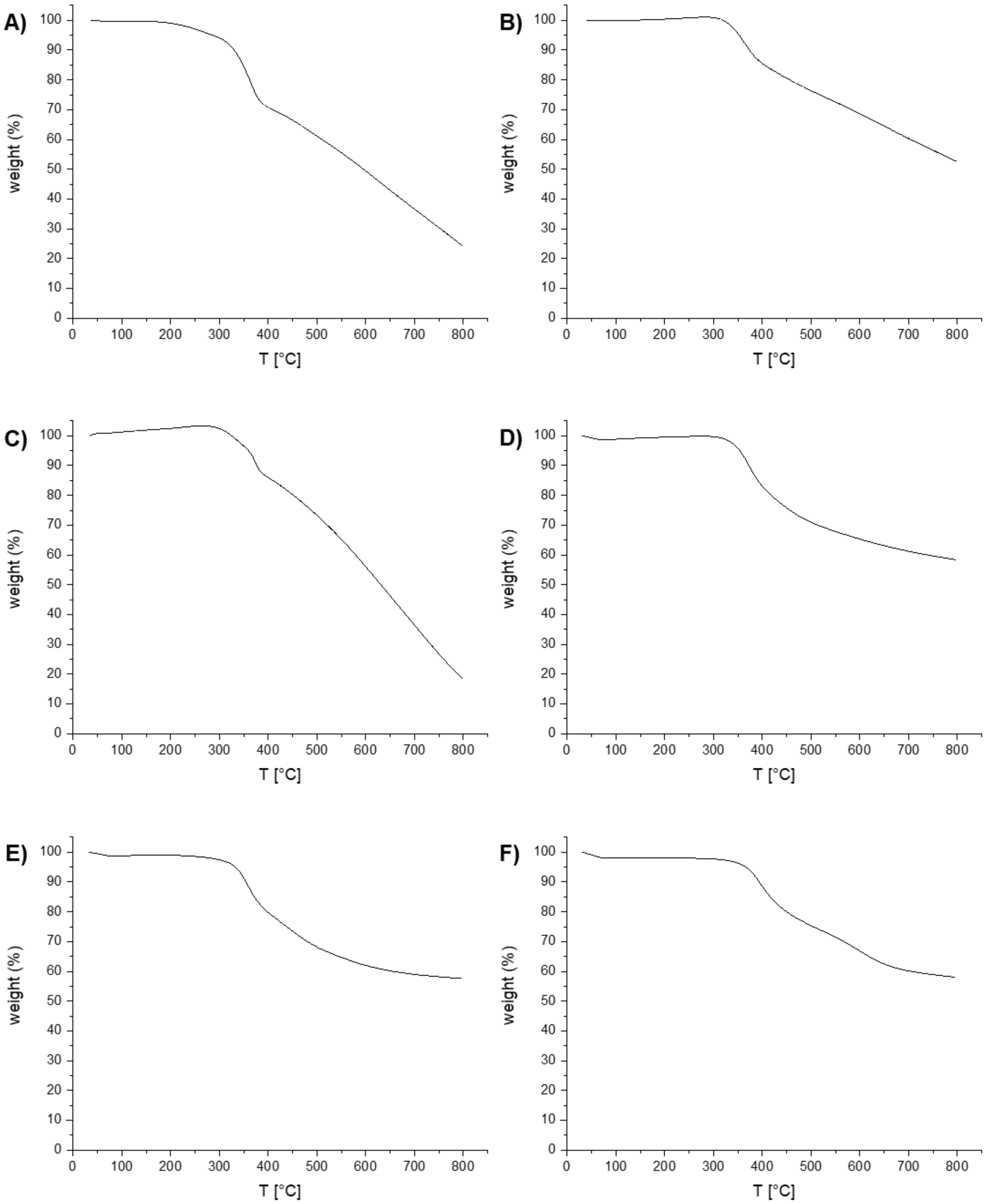


Figure S34: Thermogravimetric analysis (under N_2 atmosphere) of A) **3-Et-Et-Cage** B) **3-Et-H-Cage** C) **3-Et-Et-Polymer** D) **3-Et-H-Polymer** E) **3-H-Et-Polymer** F) **3-H-H-Polymer**.

10 Gas sorption measurements

The samples **3-Et-Et**-Cage, **3-Et-Et**-Polymer, **3-Et-H**-Cage, **3-Et-H**-Polymer, **3-H-Et**-Polymer and **3-H-H**-Polymer were investigated “as synthesized”. Prior to the measurements, the samples were further evacuated at 120 ºC under vacuum (10^{-2} Pa) overnight.

The samples **3-Et-Et**-Cage$_{\Delta}$ (α-modification) and **3-Et-H**-Cage$_{\Delta}$ were investigated in crystalline form and prior to the measurements, the samples were further evacuated at 120 ºC under a high vacuum (10^{-2} Pa) overnight.

The samples **3-Et-Et**-Cage$_{\text{ethane}}$ and **3-Et-H**-Cage$_{\text{ethane}}$ were activated by treatment of crystals with *n*-pentane in an ultrasonic bath for 15 min. The *n*-pentane was decanted, the procedure was repeated and following the solid dried in vacuo at 40 °C for 15 min. Afterwards the material was cooled to -116 °C and soaked with liquid ethane. The suspension was stirred for 10 min. Subsequently the ethane was decanted, the procedure was repeated and the sample was further evacuated at 40 ºC under a high vacuum (10^{-2} Pa) overnight.

Table S2: Summarized surface areas (BET, N_2, 77K) of all condensation products.

Compound	**SA$_{\text{BET}}$ [m^2g^{-1}] (N_2, 77K)**
3-Et-Et-Cage$_{\text{ethane}}$	71
3-Et-Et-Cage$_{\Delta}$	11
3-Et-Et-Cage	5
3-Et-Et-Polymer	6
3-Et-H-Cage$_{\text{ethane}}$	443
3-Et-H-Cage$_{\Delta}$	27
3-Et-H-Cage	10
3-Et-H-Polymer	26
3-H-Et-Polymer	16
3-H-H-Polymer	16

Table S3: Summarized uptakes at 1 bar in wt% of **3-Et-Et**-Cage$_{\text{ethane}}$ and **3-Et-H**-Cage$_{\text{ethane}}$.

Gas	Uptake (1 bar, in wt%)					
	3-Et-Et-Cage$_{\text{ethane}}$			**3-Et-H**-Cage$_{\text{ethane}}$		
	77 K	263 K	273K	77 K	263 K	273K
N_2	7.22	-	1.30	17.15	-	1.59
H_2	0.34	-	0.08	0.93	-	0.07
CO_2	-	9.54	8.26	-	15.71	13.82
CH_4	-	1.44	1.17	-	2.63	2.17

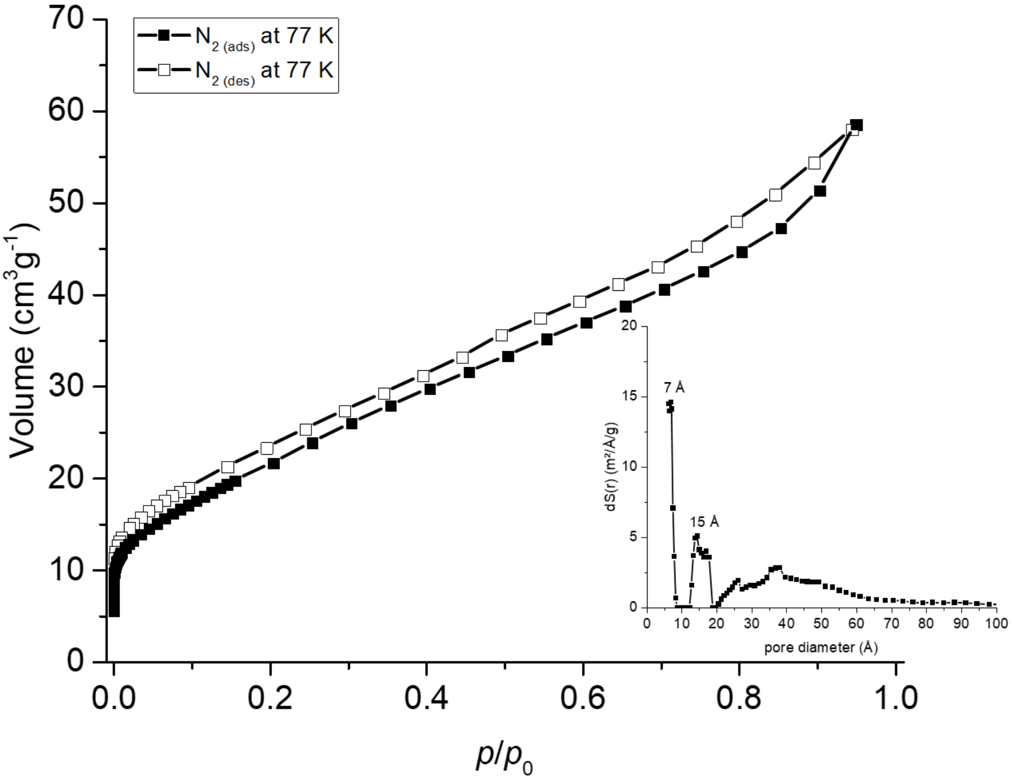


Figure S35: Gas-sorption isotherm (77 K, N_2) and pore size distribution (NLDFT, slit/cylindr. pores) for **3-Et-Et**-Cage$_{\text{ethane}}$.

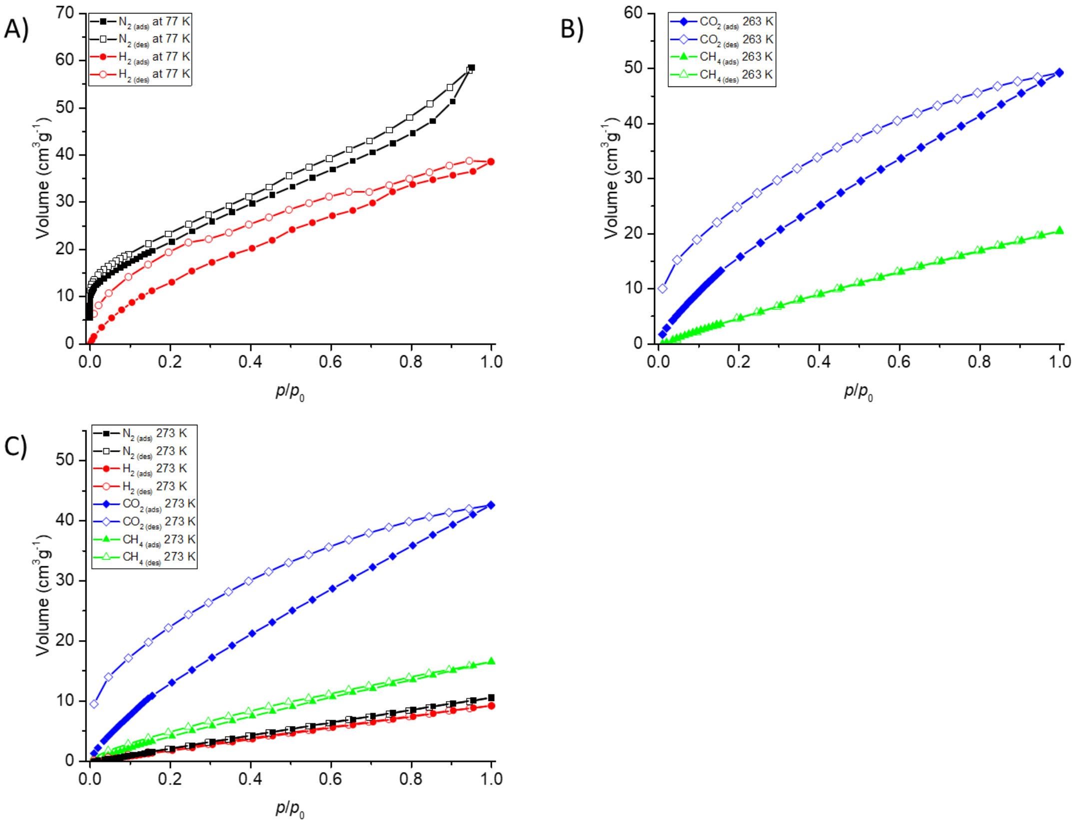


Figure S36: N_2 (black squares), H_2 (red circles), CO_2 (blue rhombs) and CH_4 (green triangles) sorption isotherms for **3-Et-Et**-Cage$_{\text{ethane}}$ (A) at 77K (B) 263 K and (C) 273 K. (filled symbols: adsorption; open symbols: desorption).

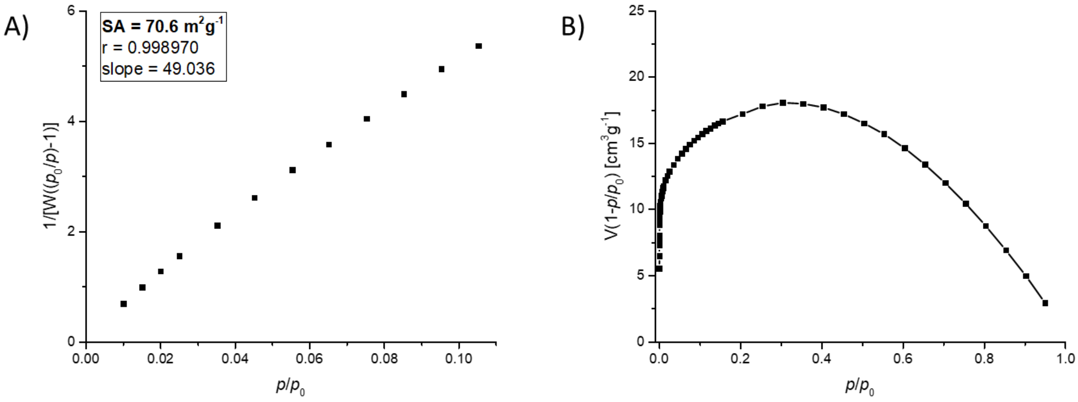


Figure S37: (A) BET-plot of **3-Et-Et**-Cage$_{\text{ethane}}$. *The selected points are located in the range below* $P/P_0 = 0.105$ *according to the Rouquerol plot of (B).*

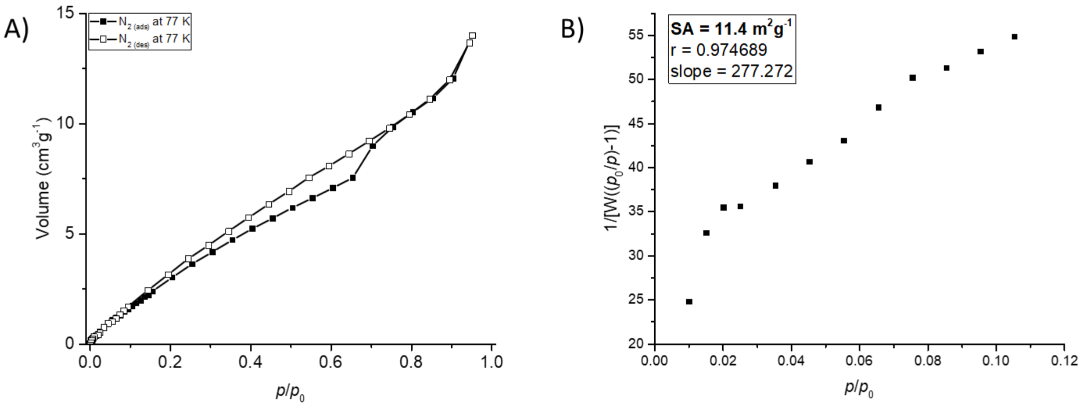


Figure S38: (A) Gas-sorption isotherm (77 K, N_2) and (B) BET-plot of for **3-Et-Et**-Cage$_{\Delta}$.

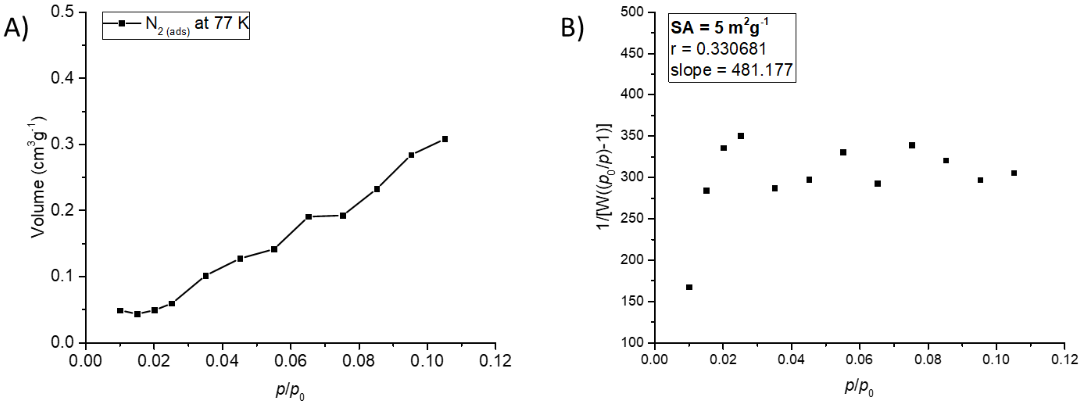


Figure S39: (A) Gas-sorption isotherm (77 K, N_2) and (B) BET-plot of for **3-Et-Et**-Cage.

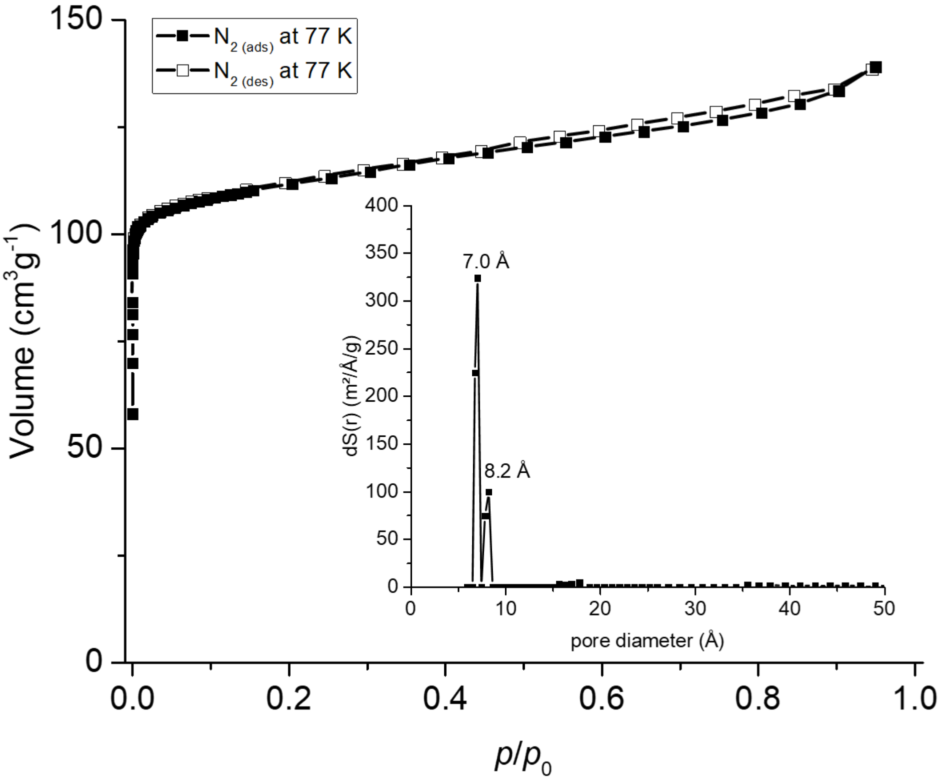


Figure S40: Gas-sorption isotherm (77 K, N_2) and pore size distribution (NLDFT, slit/cylindr. pores) for **3-Et-H**-Cage$_{\text{ethane}}$.

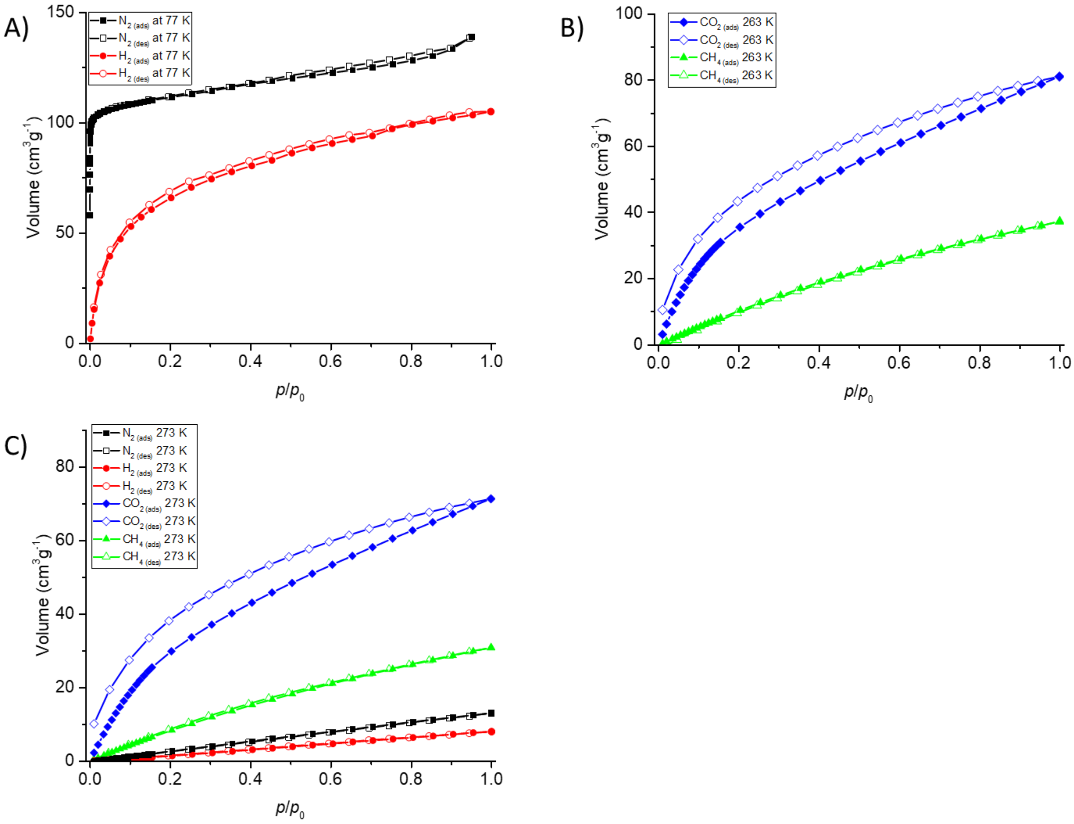


Figure S41: N_2 (black squares), H_2 (red circles), CO_2 (blue rhombs) and CH_4 (green triangles) sorption isotherms for **3-Et-H**-Cage$_{\text{ethane}}$ (A) at 77K (B) 263 K and (C) 273 K. (filled symbols: adsorption; open symbols: desorption).

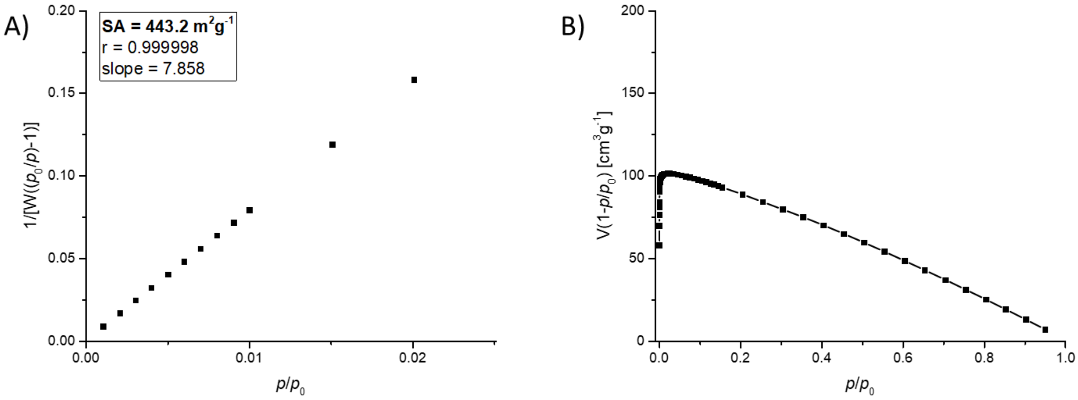


Figure S42: (A) BET-plot of **3-Et-H**-Cage$_{\text{ethane}}$. The selected points are located in the range below P/P_0 = 0.020 according to the Rouquerol plot of (B).

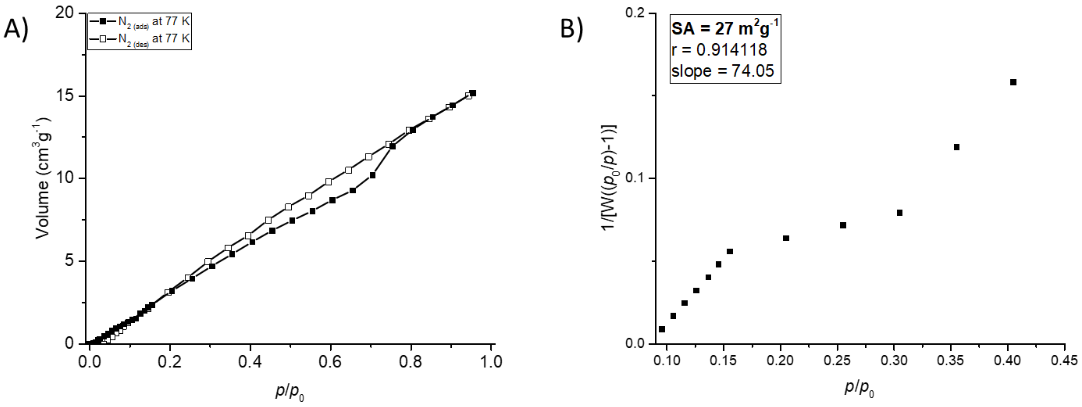


Figure S43: (A) Gas-sorption isotherm (77 K, N_2) and (B) BET-plot of for **3-Et-H**-Cage$_{\Delta}$.

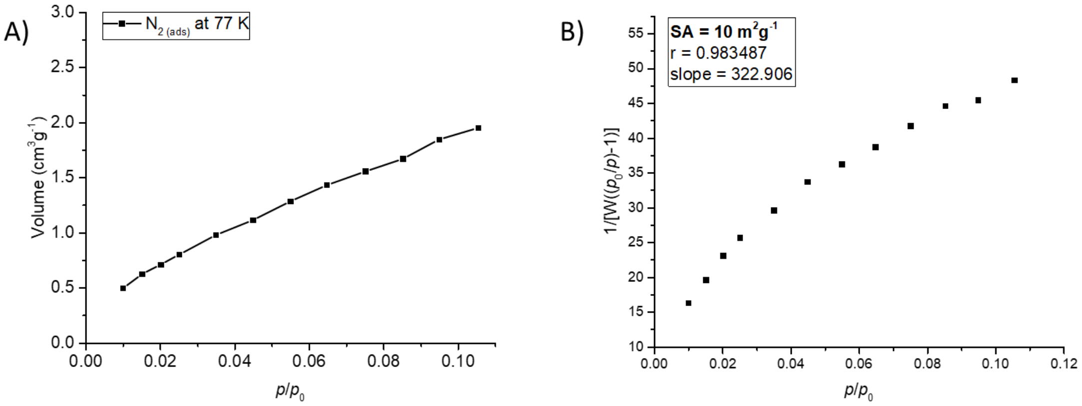


Figure S44: (A) Gas-sorption isotherm (77 K, N_2) and (B) BET-plot of for **3-Et-H**-Cage.

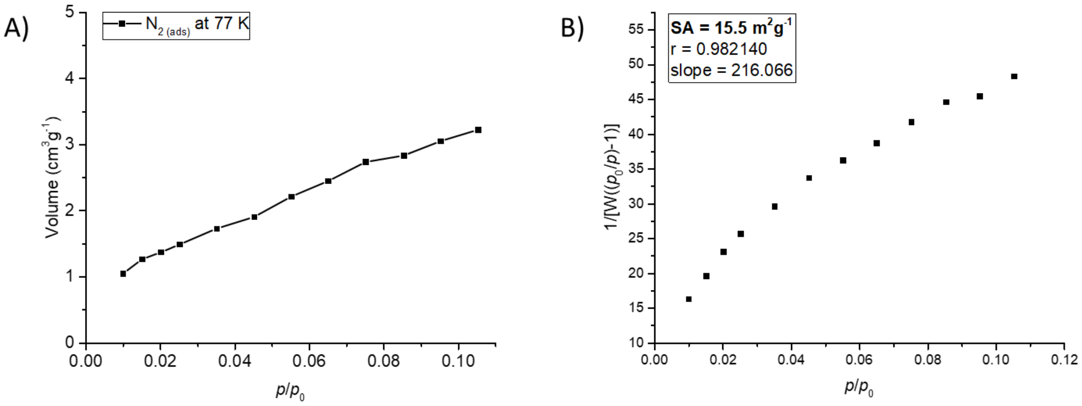


Figure S45: (A) Gas-sorption isotherm (77 K, N_2) and (B) BET-plot of for **3-H-Et**-Polymer.

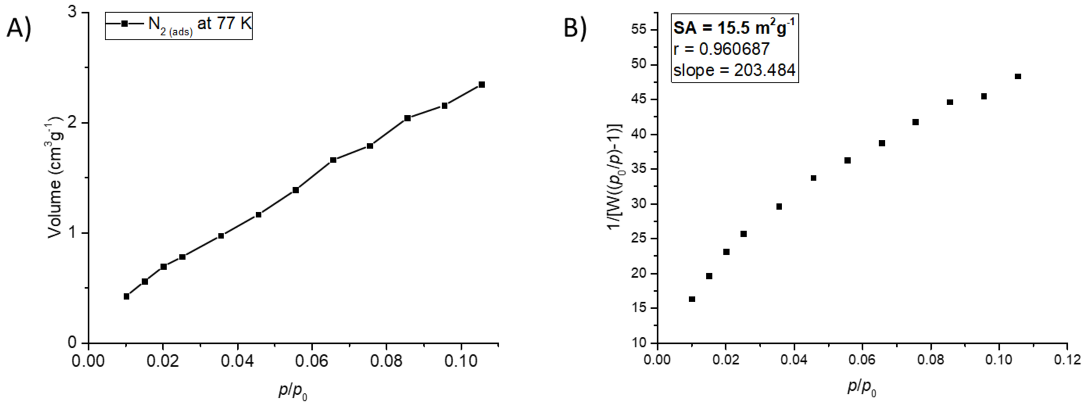


Figure S46: (A) Gas-sorption isotherm (77 K, N_2) and (B) BET-plot of for **3-H-H**-Polymer.

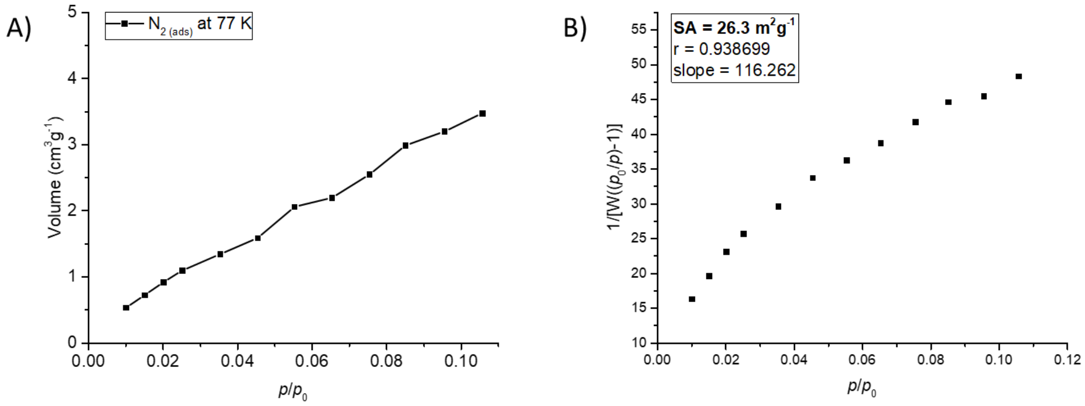


Figure S47: (A) Gas-sorption isotherm (77 K, N_2) and (B) BET-plot of for **3-Et-H**-Polymer.

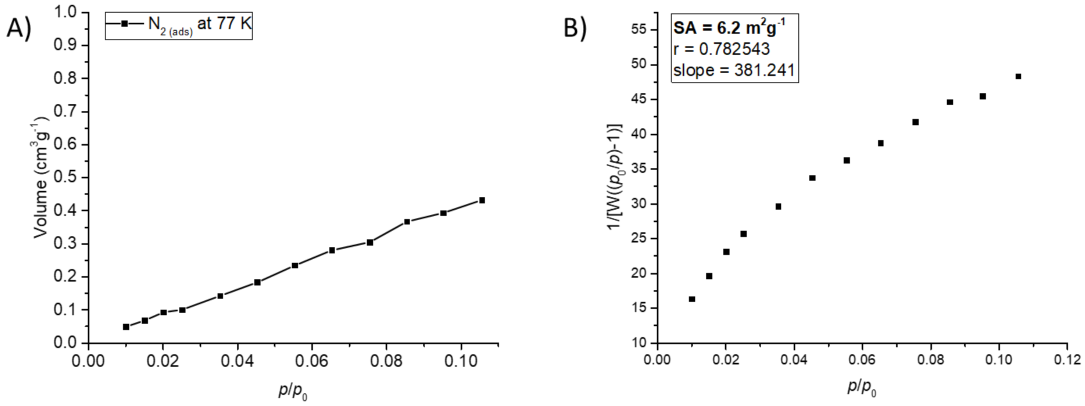


Figure S48: (A) Gas-sorption isotherm (77 K, N_2) and (B) BET-plot of for **3-Et-Et**-Polymer.

11 Electron micrographs

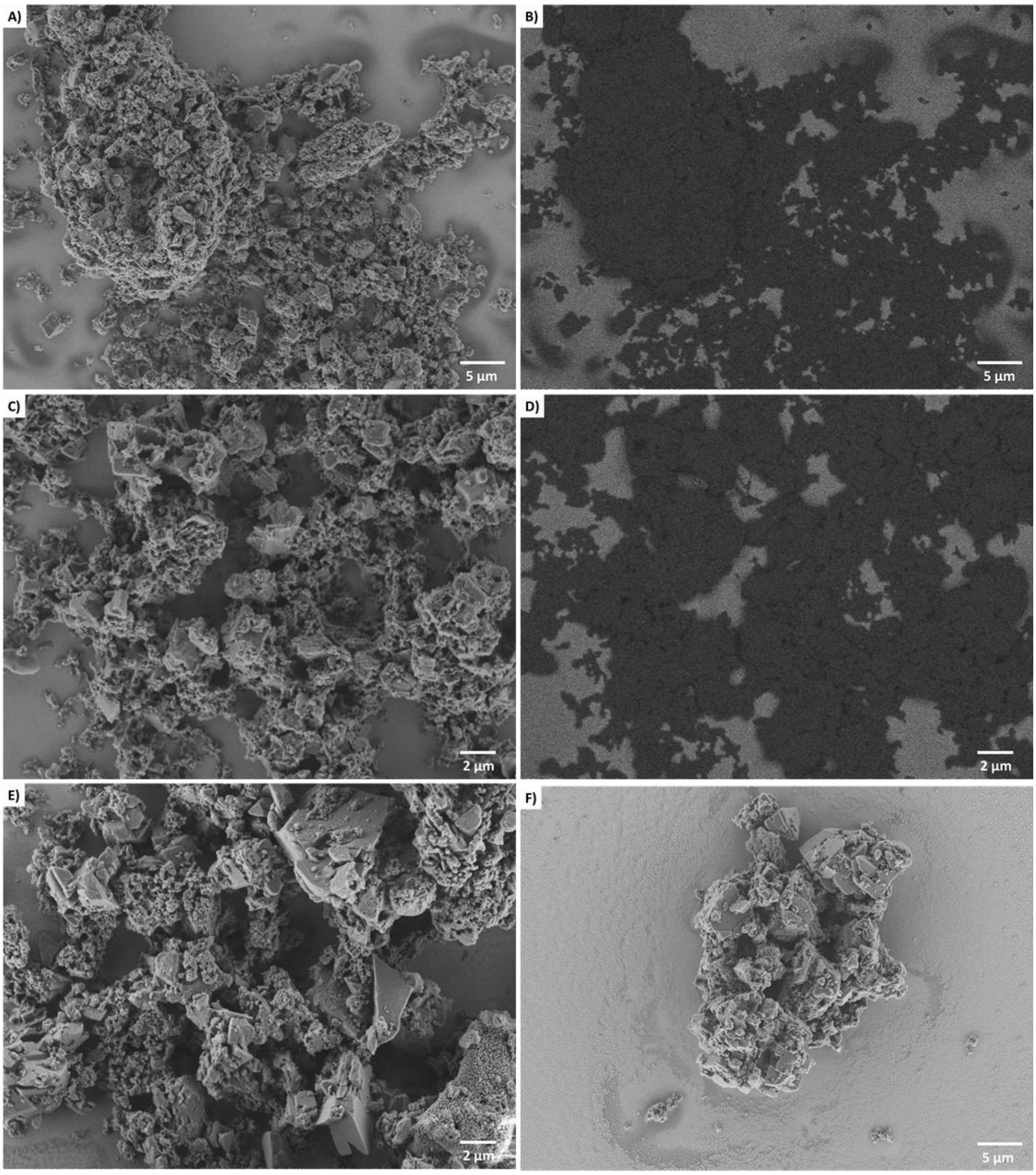


Figure S49: Electron micrographs of crystalline **3-Et-Et**-Cage (α-modification). (A), (B), (C) and (D) were captured before activation with liquid ethane, whereas (E) and (F) afterwards. Pictures (A), (C), (E) and (F) are secondary electron images, while (B) and (D) are the coressponding backscattered electron images.

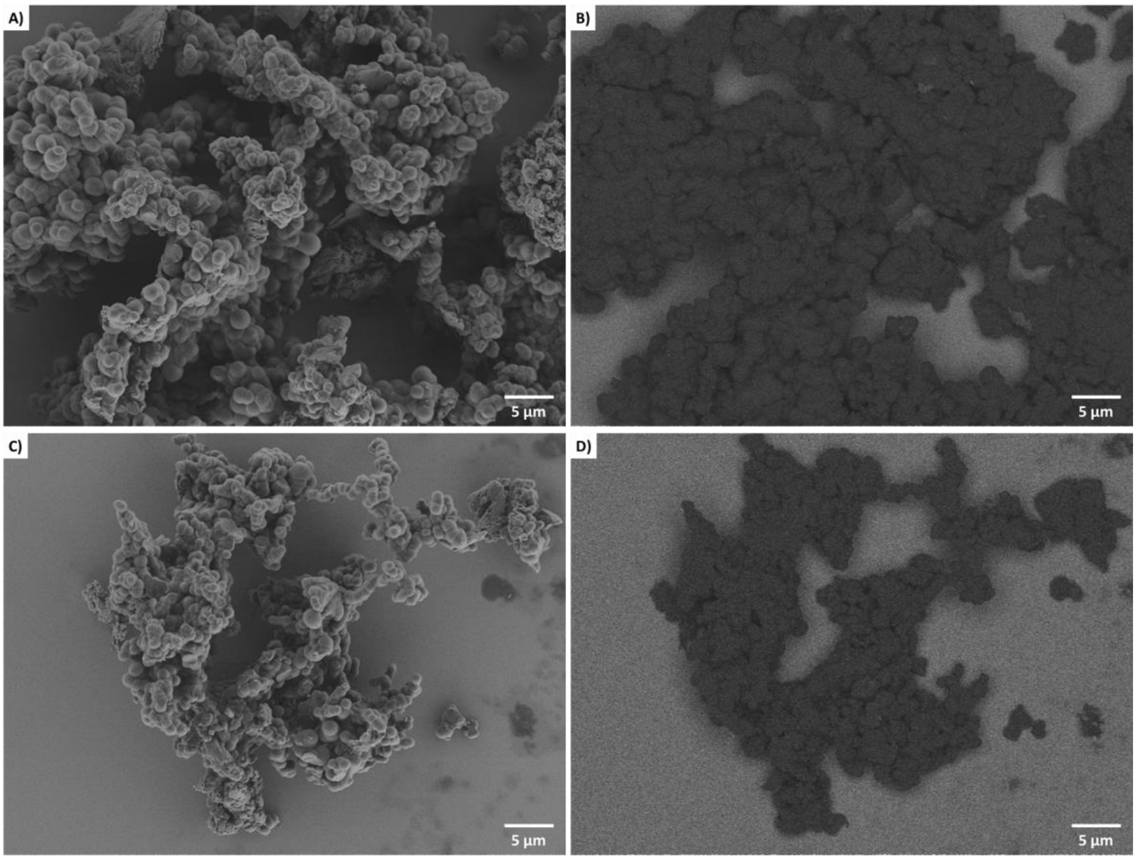


Figure S50: Electron micrographs of **3-H-H**-Polymer. (A) und (C) are secondary electron images, while (B) and (D) are the coressponding backscattered electron images.

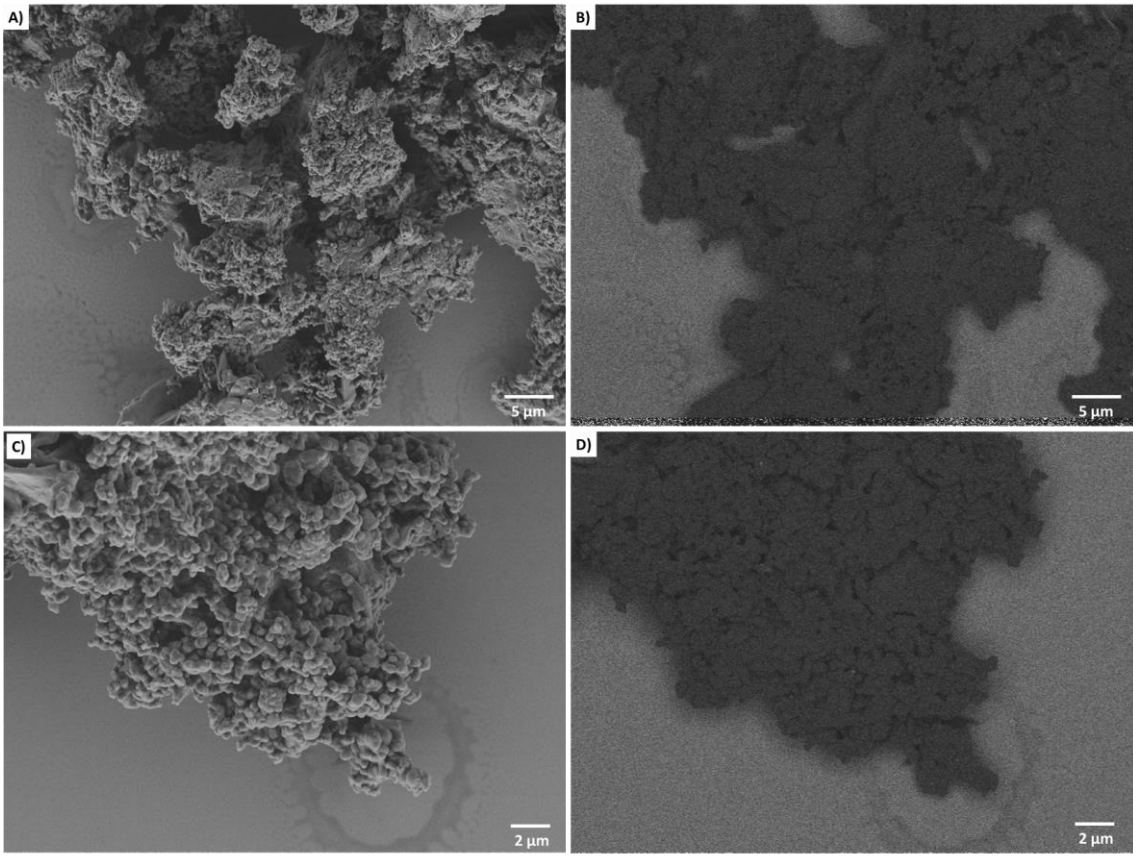


Figure S51: Electron Micrographs of **3-H-Et**-Polymer. (A) und (C) are secondary electron images, while (B) and (D) are the coressponding backscattered electron images.

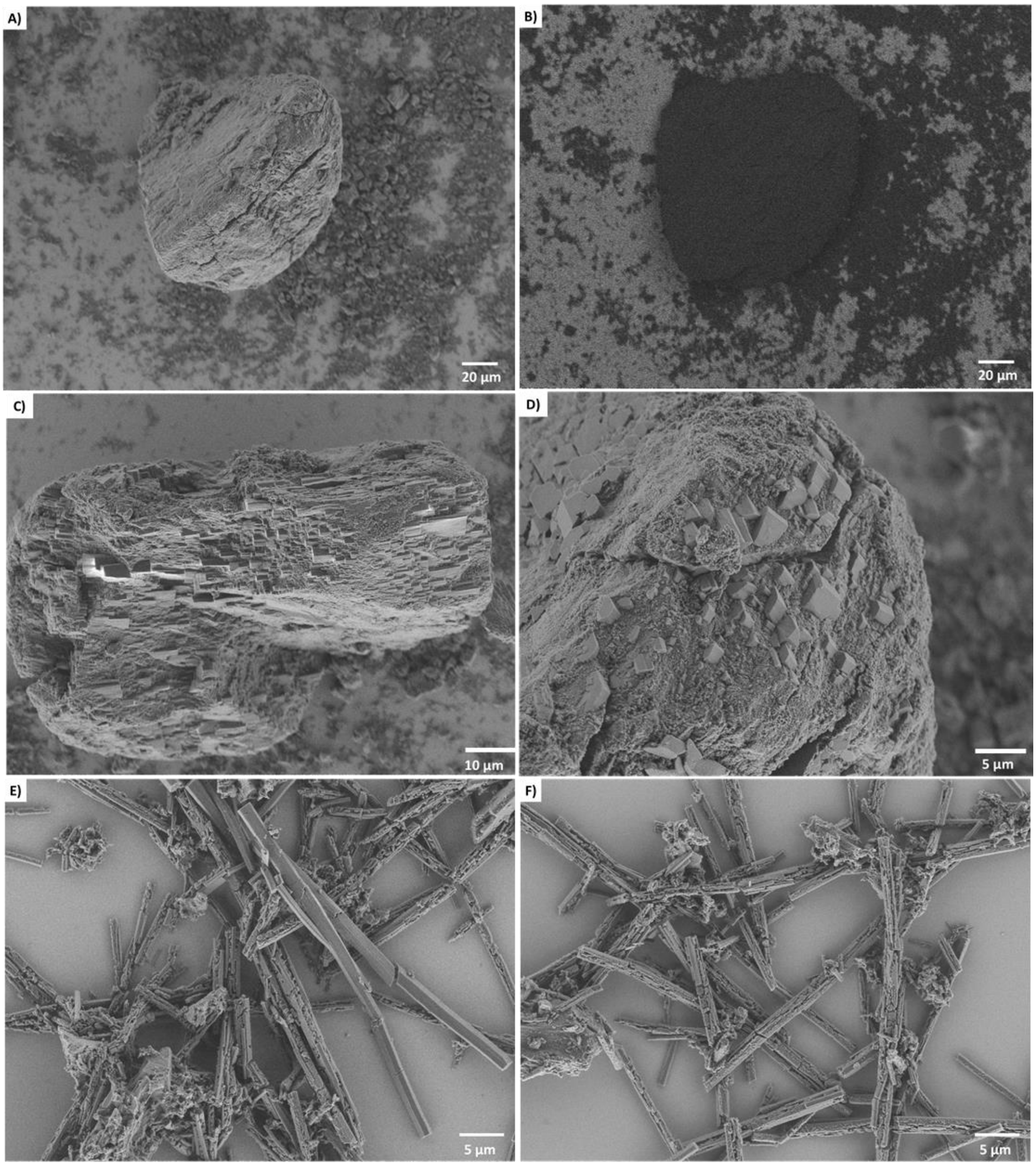


Figure S52: Electron micrographs of crystalline **3-Et-H**-Cage. (A), (B), (C) and (D) were captured before activation with liquid ethane, whereas (E) and (F) afterwards. Pictures (A), (C), (E) and (F) are secondary electron images, while (B) and (D) are the coressponding backscattered electron images.

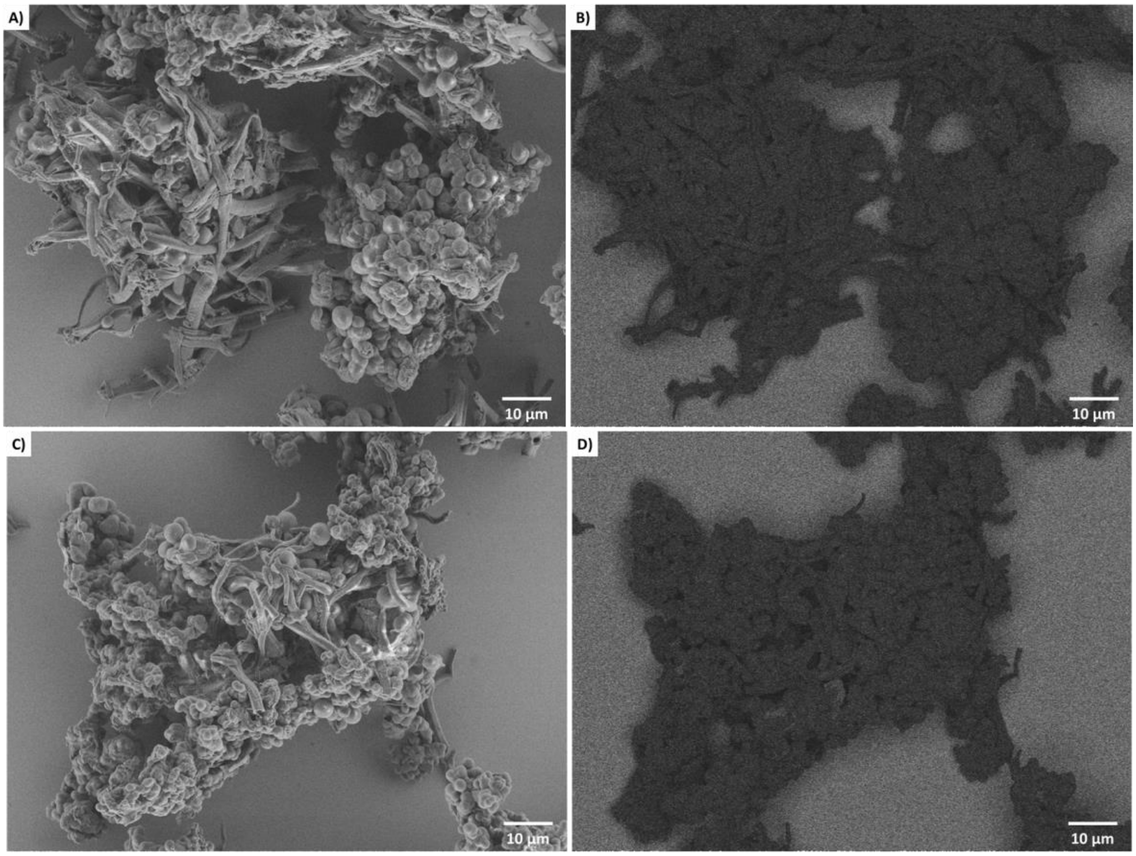


Figure S53: Electron micrographs of **3-Et-H**-Polymer. (A) und (C) are the secondary electron images, while (B) and (D) are the coressponding backscattered electron images

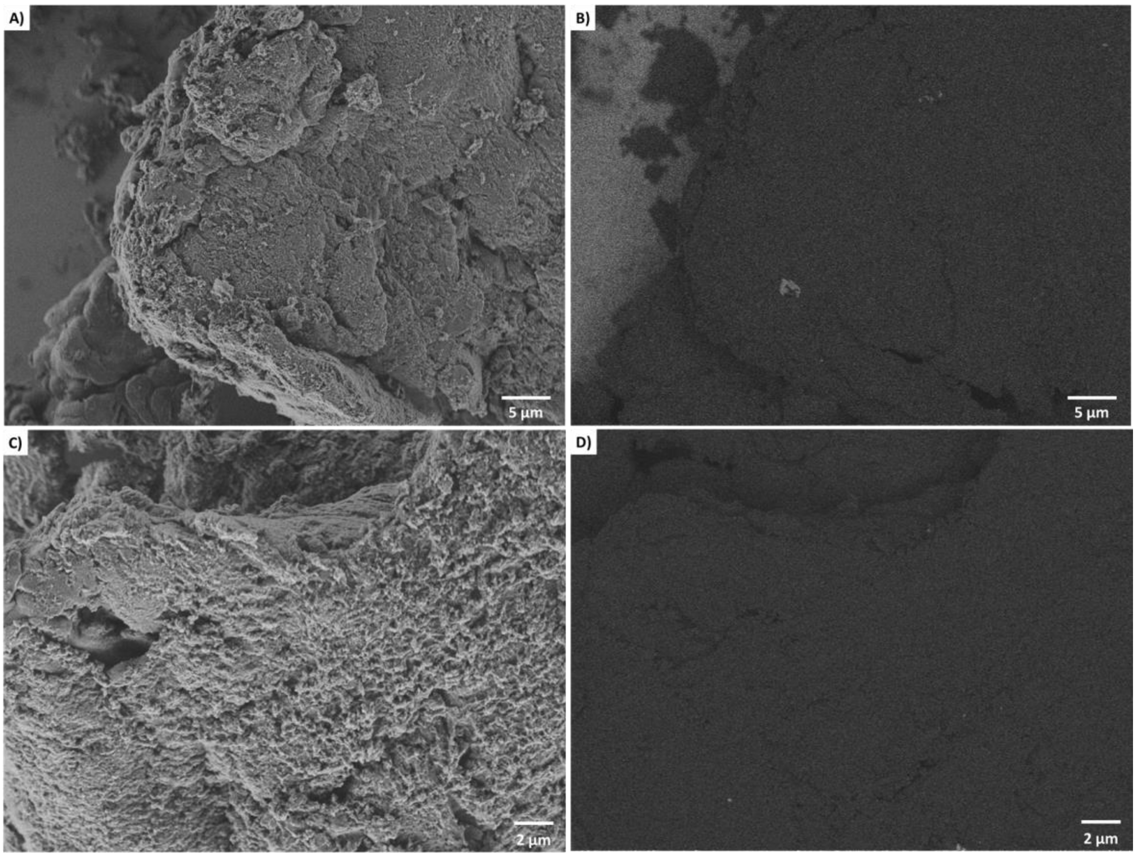


Figure S54: Electron micrographs of **3-Et-Et**-Polymer. (A) und (C) are secondary electron images, while (B) and (D) are the coressponding backscattered electron images.

12 Powder X-ray diffractograms

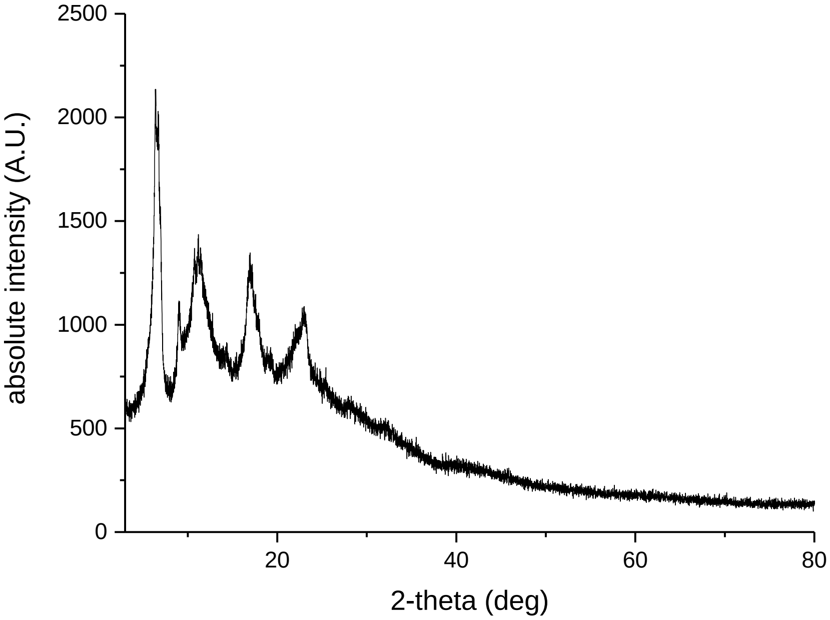


Figure S55: Powder X-ray diffraction profile of **3-Et-Et**-Cage$_{\Delta}$.

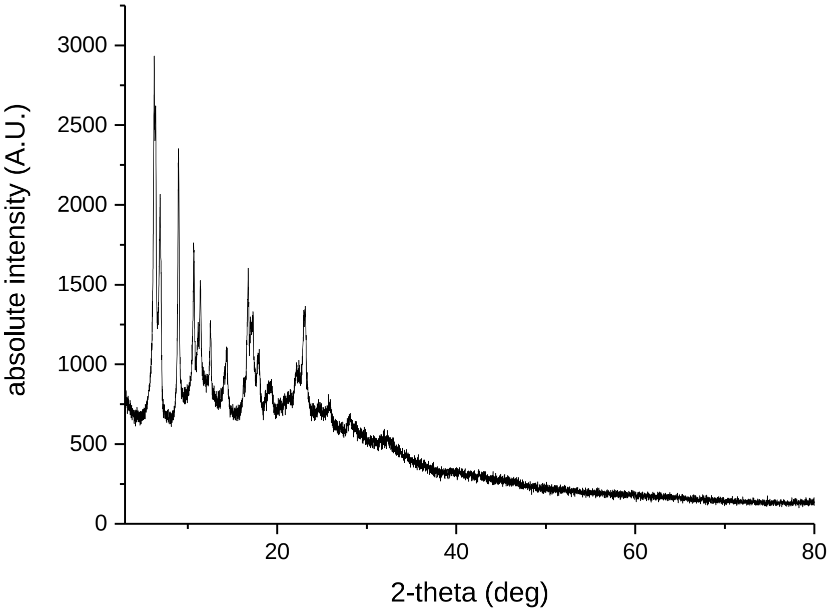


Figure S56: Powder X-ray diffraction profile of **3-Et-Et**-Cage$_{\text{ethane}}$.

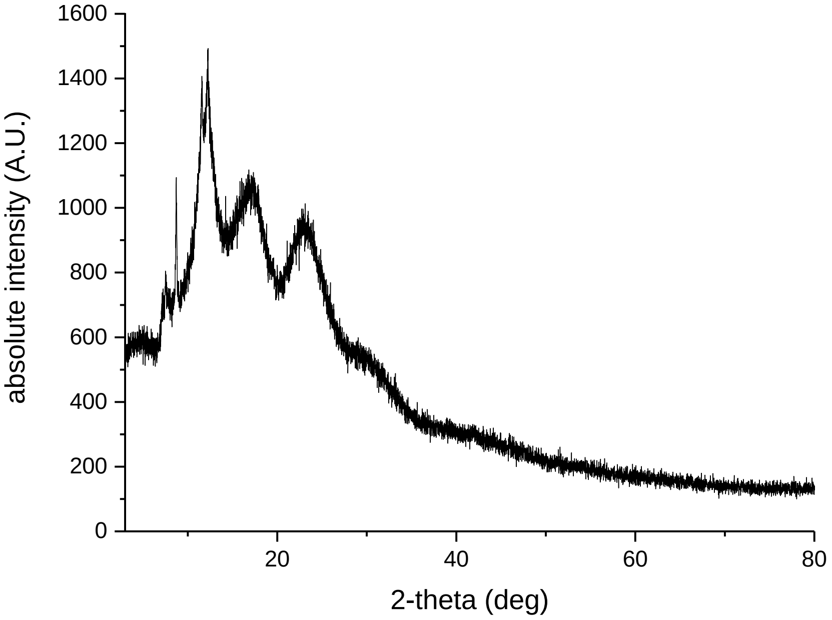


Figure S57: Powder X-ray diffraction profile of **3-Et-H**-Cage$_{\Delta}$.

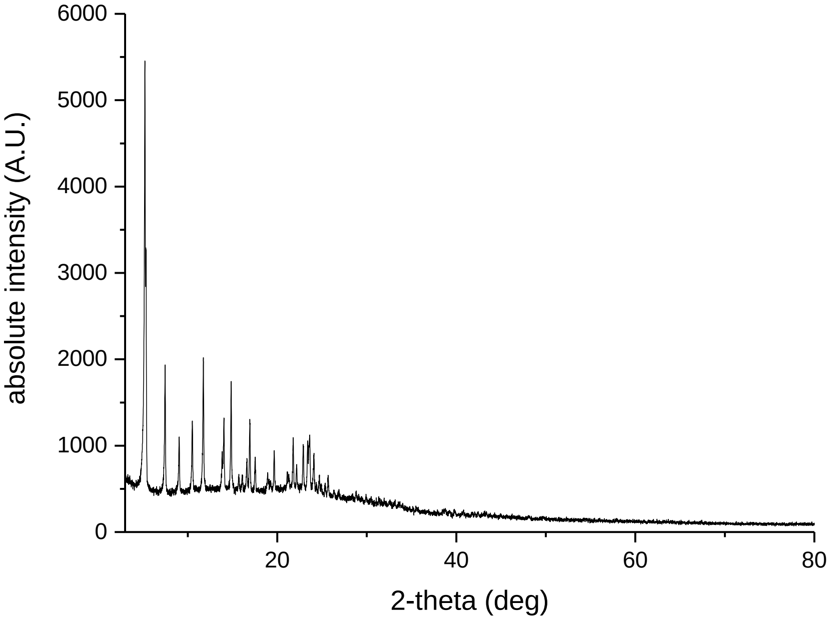


Figure S58: Powder X-ray diffraction profile of **3-Et-H**-Cage$_{\text{ethane}}$.

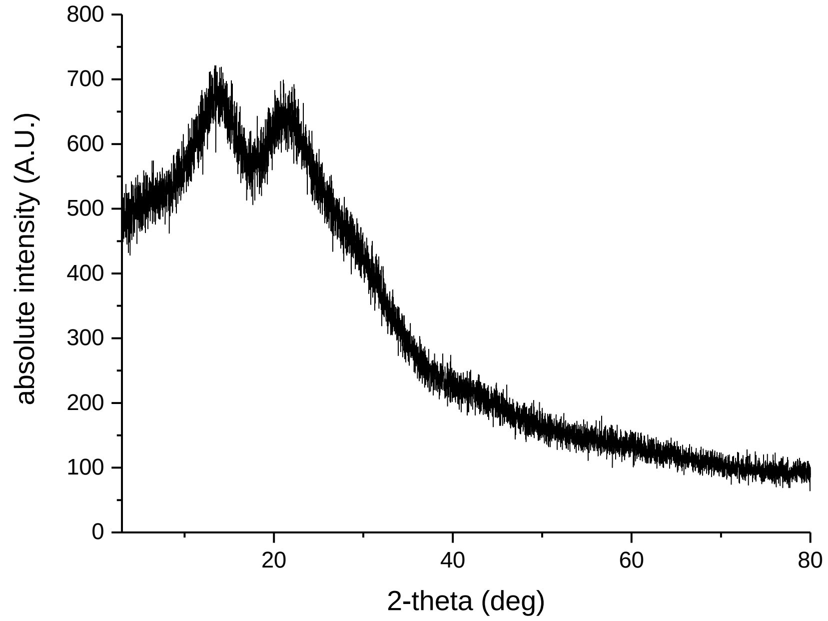


Figure S59: Powder X-ray diffraction profile of **3-Et-H**-Polymer.

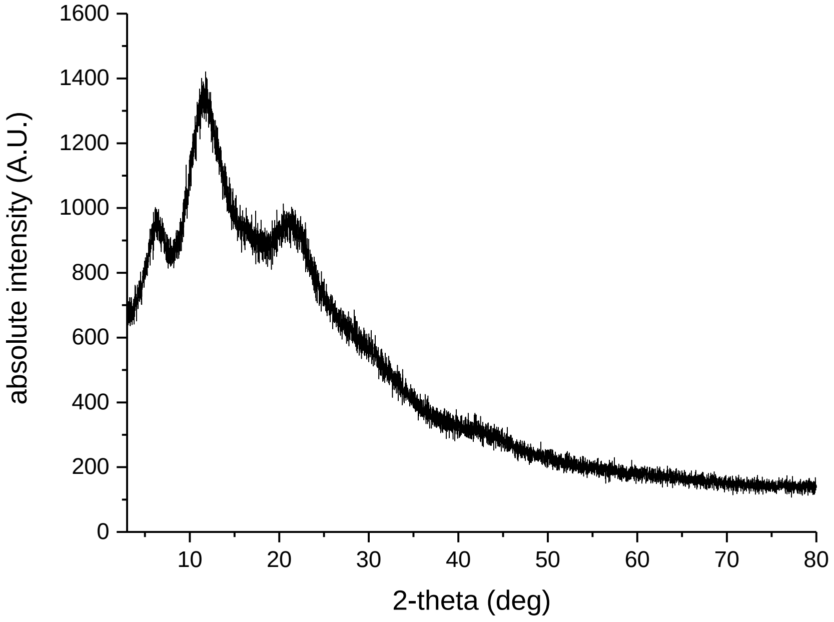


Figure S60: Powder X-ray diffraction profile of **3-Et-Et**-Polymer.

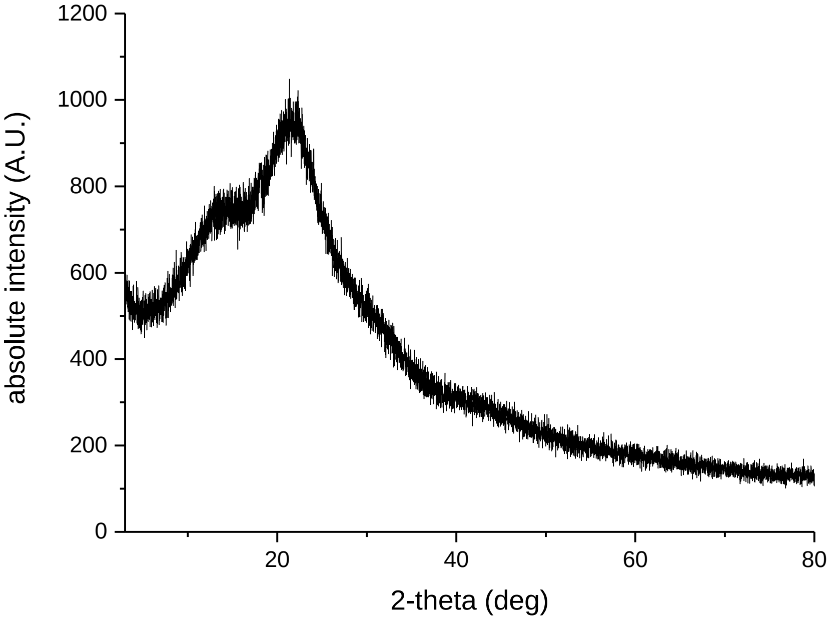


Figure S61: Powder X-ray diffraction profile of **3-H-Et**-Polymer.

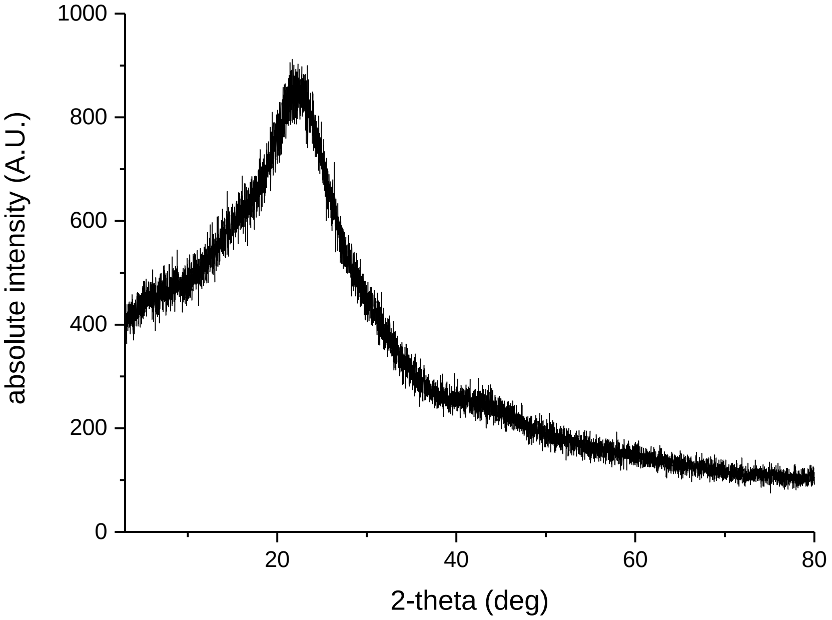


Figure S62: Powder X-ray diffraction profile of **3-H-H**-Polymer.

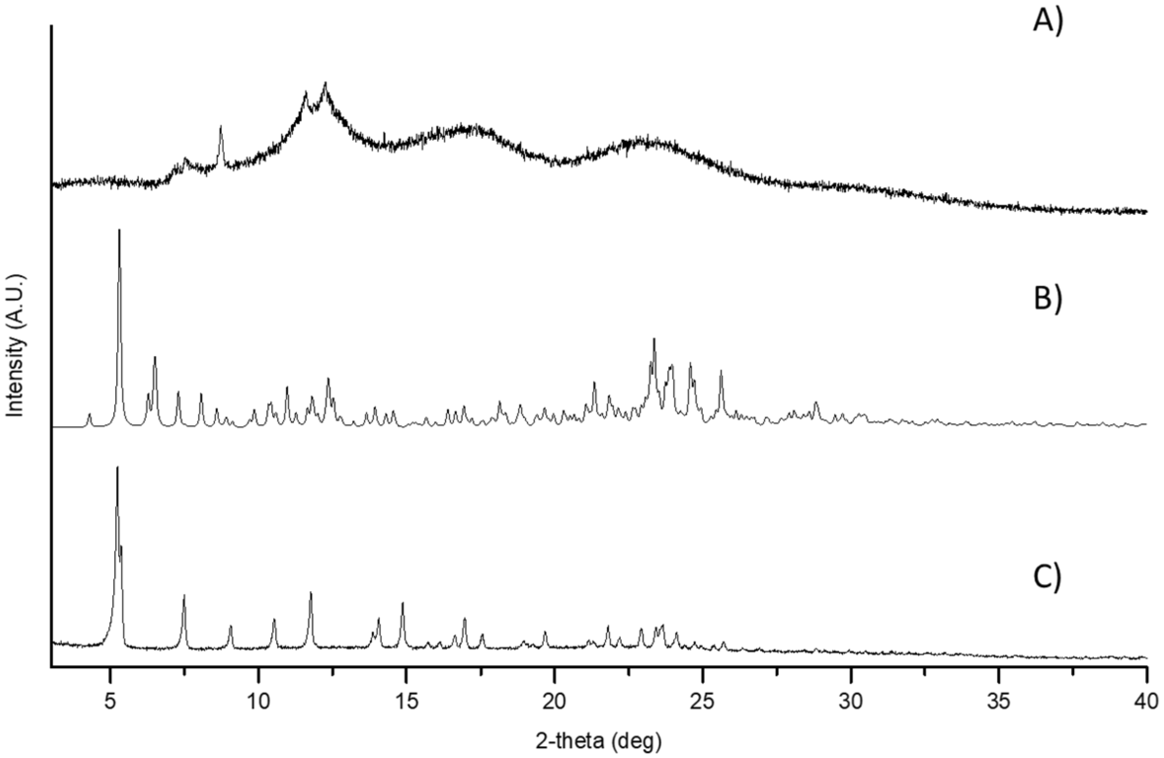


Figure S63: Powder X-ray diffraction profiles comparison between (A) **3-Et-H**-Cage$_{\Delta}$, (B) **3-Et-H**-Cage$_{calc}$ and (C) **3-Et-H**-Cage$_{ethane}$. **3-Et-H**-Cage$_{calc}$ (B) is a simulated powder X-ray diffraction profile received from single-crystal X-ray diffraction data.

13 Single-crystal X-ray diffraction data

General remarks

All crystals were obtained in closed flat bottom tubes (35 x 7.8 mm) by very slow evaporation of the appropriate solvent through a PE-plug (1-4 weeks). The crystallisation batches were protected from light. All obtained crystals of cages are extremely sensitive to the loss of solvent, and needed to be kept under a solvent atmosphere all the time or cooled down to – 78 °C.

Crystal structure of compound 1-Et

CCDC-number : 1588271
Solvent : $CHCl_3$

Table 1: Crystal data and structure refinement for.

Empirical formula	$C_{15}H_{27}N_3$	
Formula weight	249.39	
Temperature	200(2) K	
Wavelength	0.71073 Å	
Crystal system	monoclinic	
Space group	$P2_1/c$	
Z	4	
Unit cell dimensions	a =9.1876(6) Å	α = 90 deg.
	b = 15.9379(10) Å	β = 102.9749(19) deg.
	c = 10.0928(7) Å	γ = 90 deg.
Volume	1440.17(16) Å^3	
Density (calculated)	1.15 g/cm^3	
Absorption coefficient	0.07 mm^{-1}	
Crystal shape	polyhedron	
Crystal size	0.080 x 0.060 x 0.050 mm^3	
Crystal colour	colourless	
Theta range for data collection	2.3 to 25.0 deg.	
Index ranges	$-10 \le h \le 10$, $-18 \le k \le 18$, $-12 \le l \le 12$	
Reflections collected	9063	
Independent reflections	2533 (R(int) = 0.0368)	
Observed reflections	1727 ($I > 2\sigma(I)$)	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	0.96 and 0.89	
Refinement method	Full-matrix least-squares on F^2	
Data/restraints/parameters	2533 / 0 / 190	
Goodness-of-fit on F^2	1.05	
Final R indices (I>2sigma(I))	R1 = 0.049, wR2 = 0.122	
Largest diff. peak and hole	0.19 and -0.17 eÅ^{-3}	

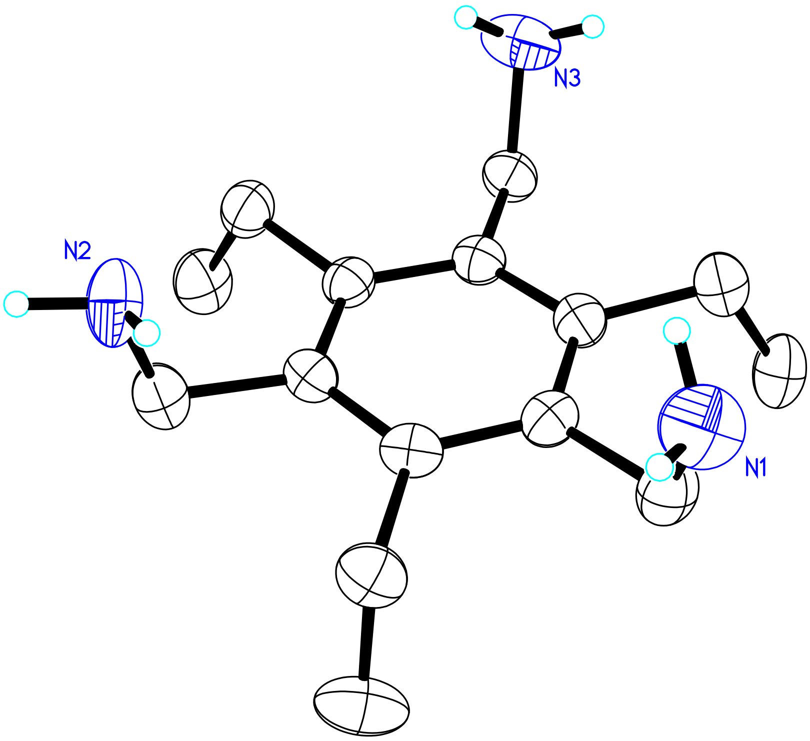


Figure S64: Molecular structure of **1-Et** as determined by X-ray diffraction. Atoms of carbon are depicted in white and nitrogen in blue.

Crystal structure of compound 3-Et-Et-α

CCDC-number	: 1588270
Solvent	: $CHCl_3$

Table 2: Crystal data and structure refinement.

Identification code	jol1sq	
Empirical formula	$C_{120}H_{156}N_{12}$	
Formula weight	1766.56	
Temperature	100(2) K	
Wavelength	1.54178 Å	
Crystal system	trigonal	
Space group	R3	
Z	3	
Unit cell dimensions	a = 25.004(3) Å	α = 90 deg.
	b = 25.004(3) Å	β = 90 deg.
	c = 20.623(5) Å	γ =120 deg.
Volume	11166(4) Å^3	
Density (calculated)	0.79 g/cm^3	
Absorption coefficient	0.35 mm^{-1}	
Crystal shape	plate	
Crystal size	0.150 x 0.100 x 0.004 mm^3	
Crystal colour	colourless	
Theta range for data collection	4.8 to 47.2 deg.	
Index ranges	$-13\leq h\leq 23$, $-20\leq k\leq 23$, $-19\leq l\leq 19$	

Reflections collected	4324
Independent reflections	2695 (R(int) = 0.1161)
Observed reflections	1454 (I > 2σ(I))
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	1.96 and 0.44
Refinement method	Full-matrix least-squares on F^2
Data/restraints/parameters	2695 / 442 / 373
Goodness-of-fit on F^2	1.13
Final R indices (I>2sigma(I))	R1 = 0.114, wR2 = 0.292
Absolute structure parameter	4.1(10)
Largest diff. peak and hole	0.26 and -0.27 eÅ^{-3}

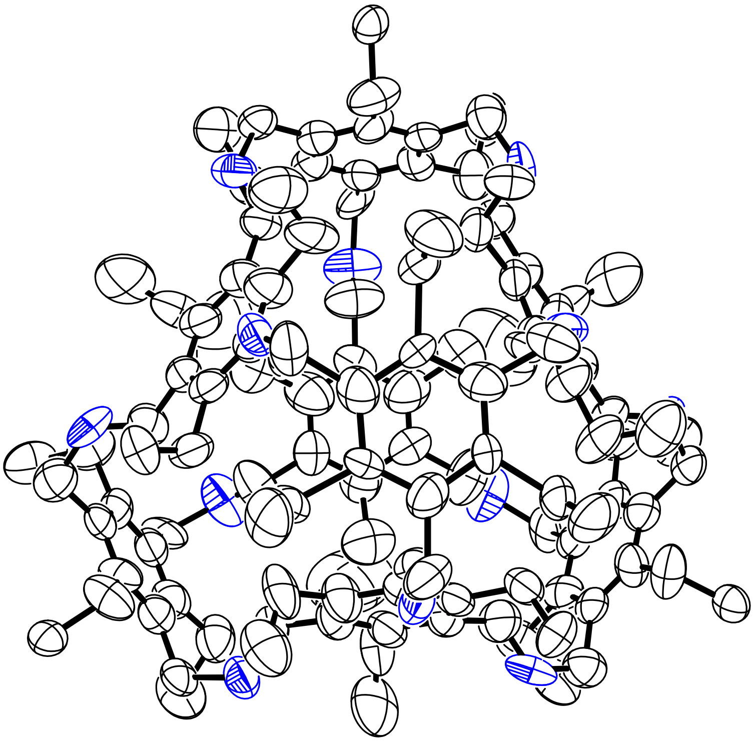


Figure S65: Molecular structure of **3aa-α** as determined by X-ray diffraction. Atoms of carbon are depicted in white and nitrogen in blue.

Crystal structure of compound 3-Et-Et-β

CCDC-number : 1588272
Solvent : Toluene

Table 2: Crystal data and structure refinement.

Identification code	jol5sq
Empirical formula	$C_{120}H_{156}N_{12}$
Formula weight	1766.56
Temperature	100(2) K
Wavelength	1.54178 Å
Crystal system	tetragonal

Space group	$P4_12_12$	
Z	4	
Unit cell dimensions	a = 15.7284(1) Å	α = 90 deg.
	b = 15.7284(1) Å	β = 90 deg.
	c = 55.3968(12) Å	γ = 90 deg.
Volume	13704.2(4) $Å^3$	
Density (calculated)	0.86 g/cm^3	
Absorption coefficient	0.38 mm^{-1}	
Crystal shape	irregular	
Crystal size	0.200 x 0.100 x 0.070 mm^3	
Crystal colour	colourless	
Theta range for data collection	3.2 to 47.2 deg.	
Index ranges	$-14 \le h \le 13$, $-14 \le k \le 14$, $-52 \le l \le 51$	
Reflections collected	32702	
Independent reflections	6162 (R(int) = 0.0475)	
Observed reflections	4237 ($I > 2\sigma(I)$)	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	1.61 and 0.65	
Refinement method	Full-matrix least-squares on F^2	
Data/restraints/parameters	6162 / 1155 / 595	
Goodness-of-fit on F^2	1.03	
Final R indices (I>2sigma(I))	R1 = 0.089, wR2 = 0.245	
Absolute structure parameter	0.4(3)	
Largest diff. peak and hole	0.38 and -0.26 $eÅ^{-3}$	

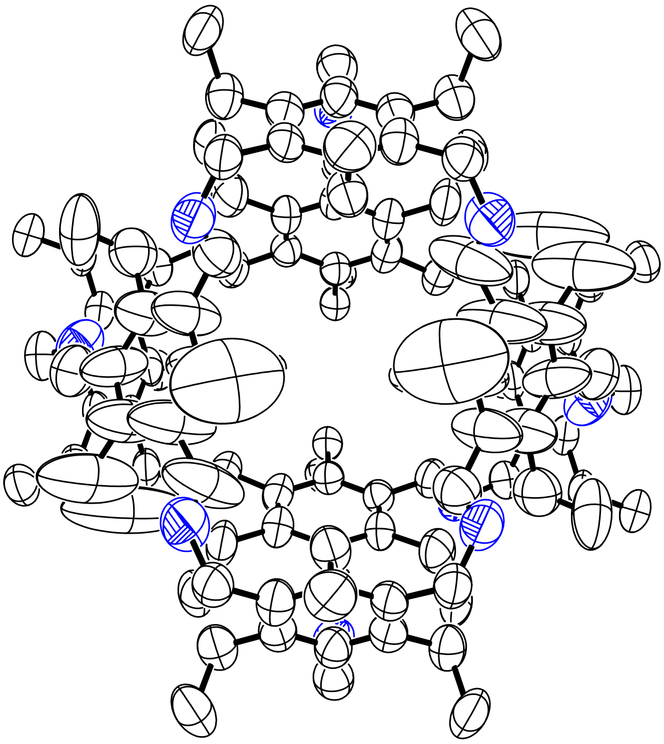


Figure S66: Molecular structure of **3-Et-Et-β** as determined by X-ray diffraction. Atoms of carbon are depicted in white and nitrogen in blue.

Crystal structure of compound 3-Et-H

CCDC-number : 1588273
Solvent : CH_2Cl_2

Table 2: Crystal data and structure refinement for jol8.

Identification code	jol8
Empirical formula	$C_{107}H_{130}Cl_{22}N_{12}$
Formula weight	2364.12
Temperature	100(2) K
Wavelength	1.54178 Å
Crystal system	monoclinic
Space group	$P2_1/n$
Z	4
Unit cell dimensions	a = 16.0211(8) Å α = 90 deg.
	b = 41.134(2) Å β =110.782(4) deg.
	c = 19.4840(10) Å γ = 90 deg.
Volume	12004.8(11) $Å^3$
Density (calculated)	1.31 g/cm^3
Absorption coefficient	4.97 mm^{-1}
Crystal shape	plate
Crystal size	0.180 x 0.120 x 0.040 mm^3
Crystal colour	colourless
Theta range for data collection	3.1 to 44.5 deg.
Index ranges	$-13 \le h \le 14$, $-37 \le k \le 37$, $-17 \le l \le 17$
Reflections collected	36874
Independent reflections	9224 (R(int) = 0.1379)
Observed reflections	5738 ($I > 2\sigma(I)$)
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	2.48 and 0.45
Refinement method	Full-matrix least-squares on F^2
Data/restraints/parameters	9224 / 4470 / 1315
Goodness-of-fit on F^2	2.12
Final R indices (I>2sigma(I))	R1 = 0.200, wR2 = 0.505
Largest diff. peak and hole	1.73 and -0.76 $eÅ^{-3}$

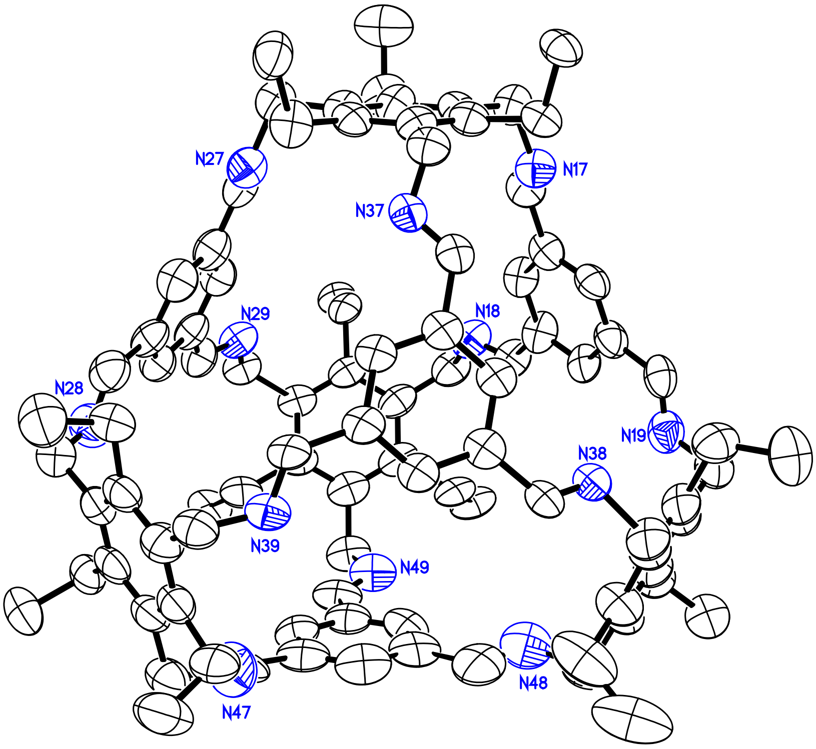


Figure S67: Molecular structure of **3-Et-H** as determined by X-ray diffraction. Atoms of carbon are depicted in white and nitrogen in blue.

14 Reference

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