Supporting Information

Influence of one-pot approach on the prepared CuS macro/nanostructure from various molecular precursors

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3.2 Ammonium *N*-aniline-4-dithiocarbamate *and N*-piperidine-1-dithiocarbamate preparation

Ammonium *N*-anildithiocarbamate and ammonium *N*-piperldithiocarbamate were synthesized according to the procedure as reported by [73] as seen in Scheme 1 and supplementary materials. **[Anildtc)]:** Yield: 5.4198 g, (77.60%), M.pt. 194-1964 C; ^{1}H NMR (DMSO) δ 7.38 (m, 8H-C_6H_5), 3.31 (s, 2H –NH), 1.5 (t, 2H-CH_2), 2.51 (s, 1H-SH). ^{13}C NMR (DMSO) δ 40 (-NH_2), 40 (-S-C), 124.8 (-C_6H_5), 203 (-CS_2). Selected IR (cm^{-1}) 1412 *v*(C-N), 1219 *v*(C-S), 3419 *v*(N-H). UV–Vis (CH_3OH solution, nm): 315. **[Piperldtc)]:** Yield: 10.6962 g, (85.70%), M.pt. 196-198 C; ^{1}H NMR (DMSO) δ 8.50 (m, 8H-C_6H_5), 3.40 (s, 2H –NH), 1.5 (t, 2H-CH_2), 2.51 (s, 1H-SH). ^{13}C NMR (DMSO) δ 40 (-NH_2), 40 (-S-C), 130 (-C_6H_5), 205 (-CS_2). Selected IR (cm^{-1}) 1412 *v*(C-N), 1219 *v*(C-S), 3296 *v*(N-H). UV–Vis (CH_3OH solution, nm): 401.

3.3 *Preparation of copper complexes, anil-piper-Cu(DTC)1, anil-Cu(DTC)2 and piper-Cu(DTC)3.*

Anil-piper-Cu (DTC) 1 was synthesized by dissolving 0.3362g (2.5mmol) of the metal salt of cucl2 in distilled water, followed by the addition of ammonium *N*-anildithiocarbamate (0.4658 g, 2.5 mmol) and ammonium *N*-piperlidithiocarbamate (0.4459 g, 2.5 mmol) in 15 ml of distilled water. The reaction occurred at room temperature and was stirred for 2 hours. Brown solid precipitates were obtained and rinsed three times with about 30 ml of distilled water before filtration with filter paper (110 mm Whatmann). A similar approach was followed for the formation of anil-Cu (DTC)2 from ammonium *N*-anildithiocarbamate (0.4658 g, 2.5 mmol) at a ratio of (2:1), giving rise to a brown solid precipitate as the final product, and piper-Cu (DTC)3 from ammonium *N*-piperldithiocarbamate (0.4459 g, 2.5 mmol) to form a light brown solid precipitate as the end product [73]. (**Anil-piper-Cu(DTC)1)** (yield: 62%; M.pt: 216–218 °C). ^{1}H NMR (DMSO) δ 7.38-10.20 (m, 8H-C_6H_5), 3.31 (s, 2H –NH), 1.5 (t, 2H-CH_2), 2.5 1(s, 1H-SH). ^{13}C NMR (DMSO) δ 40 (-NH_2), 40 (-S-C), 124.8-124.9 (-C_6H_5), 198.5 (-CS_2). Selected IR (cm^{-1}) 1504 *v*(C-N), 1236 *v*(C-S), 3141 *v*(N-H), 613 *v*(M-S). UV–Vis (CH_3OH solution, nm): 325. **(Anil-Cu(DTC)2)** (yield: 63%; M.pt: 214–216 °C). ^{1}H NMR (DMSO) δ 6.95-10.29 (m, 8H-C_6H_5), 3.47 (s, 2H –NH), 1.5 (t, 2H-CH_2), 2.51 (s, 1H-SH). ^{13}C NMR (DMSO) δ 40 (-NH_2), 40 (-S-C), 115.5-139 (-C_6H_5), 198.6 (-CS_2). Selected IR (cm^{-1}) 1503 *v*(C-N), 1237 *v*(C-S), 3141 *v*(N-H, 598 *v*(M-S). UV–Vis (CH_3OH solution, nm): 329. **(Piper-Cu(DTC)3)** (yield: 64%; dec.: 214–216 °C). ^{1}H NMR (DMSO) δ 7.38 (m, 8H-C_6H_5), 3.32-4.20 (s, 2H –NH), 1.66-1.70 (t, 2H-CH_2), 2.51 (s, 1H-SH). ^{13}C NMR (DMSO) δ 40 (-NH_2), 40 (-S-C), 120-130 (-C_6H_5), 198.5 (-CS_2). Selected IR (cm^{-1}) 1504 *v*(C-N), 1237 *v*(C-S), 3155 *v*(N-H), 615 *v*(M-S). UV–Vis (CH_3OH solution, nm): 300.

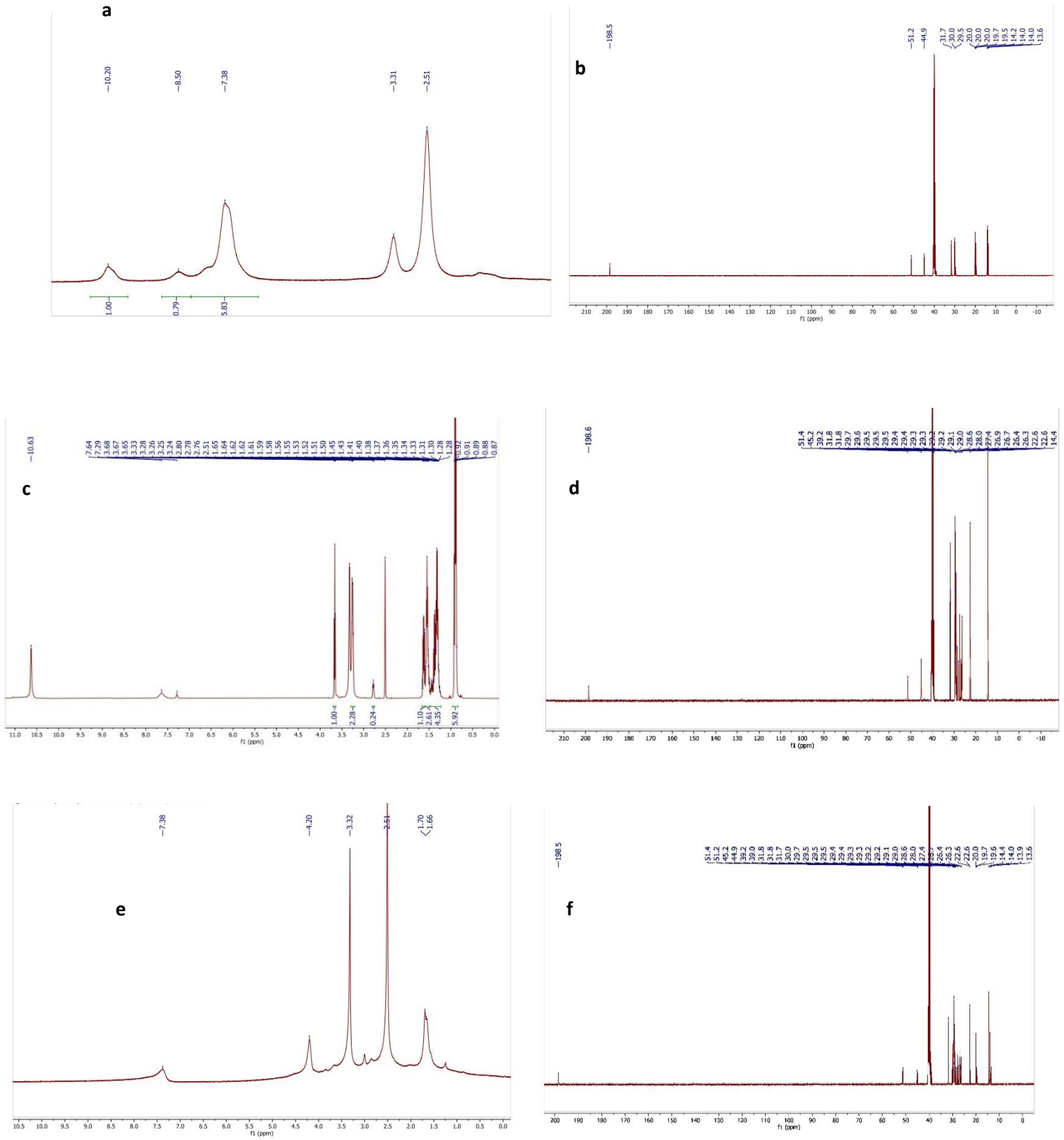

Figure S1: ^{1}H NMR spectra for *bis*(anil-piper-Cu(DTC)1, *bis*(anil-Cu(DTC)2, *bis*(piper-Cu(DTC)3) complexes as (a,b,c) and their ^{13}C NMR spectra as (d,e,f)

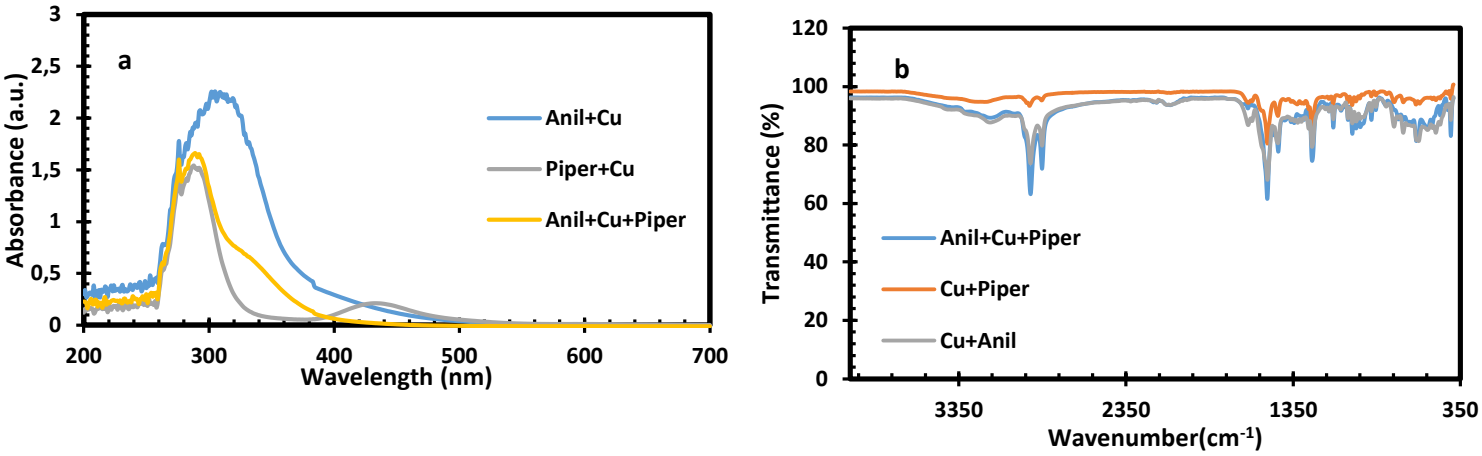

Figure S2: UV-Vis (a) and FTIR (b) spectra for *bis*(anil-piper-Cu(DTC)1, *bis*(anil-Cu(DTC)2 and *bis*(piper-Cu(DTC)3) complexes