Electronic Supplementary Material (ESI) for RSC Advances.

Synthesis of the first magnetic nano particles with thiourea dioxide-based sulfonic acid tag: Application at the one-pot synthesis of 1,1,3-tri(1*H*-indol-3-yl) alkanes under mild and green conditions

Mohammad Ali Zolfigol,* Roya Ayazi-Nasrabadi*

Faculty of Chemistry, Bu-Ali Sina University, Hamedan 6517838683, Iran

*Corresponding Author: Fax: +988138257407

E-mail: zolfi@basu.ac.ir and mzolfigol@yahoo.com (M. A. Zolfigol) and r.ayazi.86@gmail.com (R. Ayazi-Nasrabadi).

Supplemntary data:

Spectral data analysis for compounds.

3-(1,3-bis(7-nitro-1H-indol-3-yl)butyl)-7-nitro-1H-indole (Table 3, entry 4)

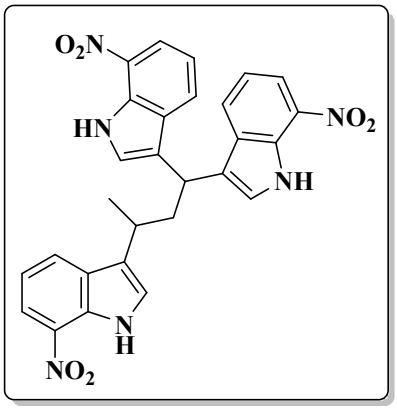
Orange solid; M.p. 140-141 °C; Yield: 85%.

IR(KBr): 3438, 3089, 2925, 1630, 1556, 1513, 1481, 1320, 1222, 1089, 806, 733, 538 Cm^{-1}.

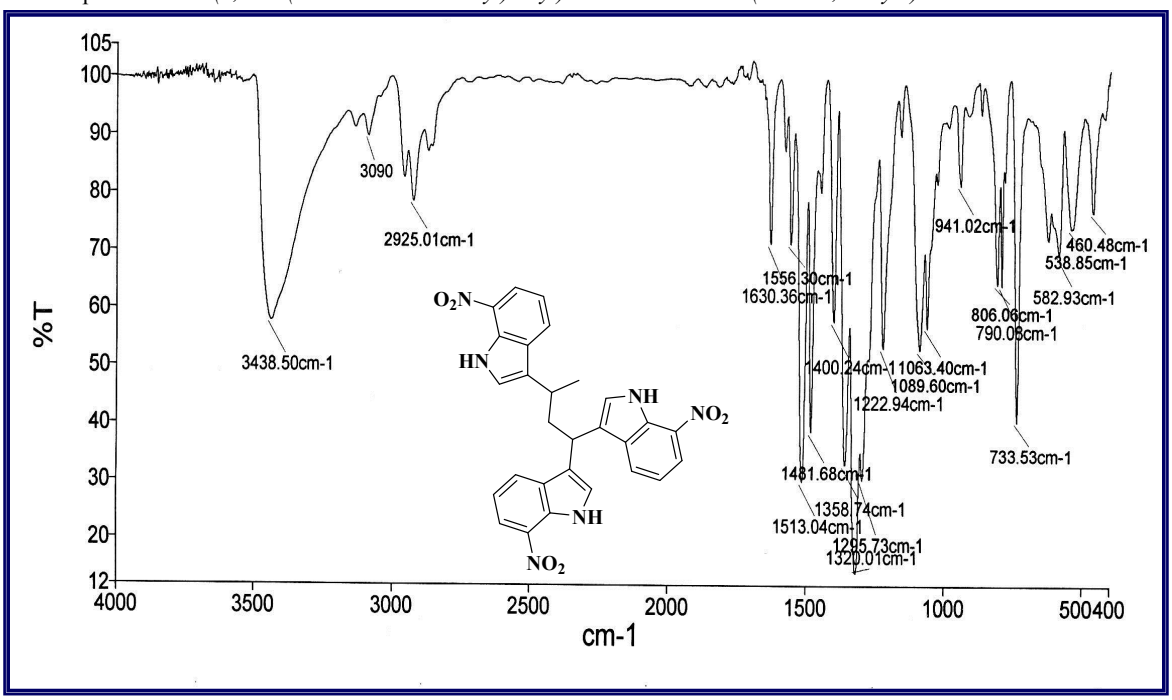
^{1}H NMR (300 MHz, DMSO-d_6): δ = 1.37 (d, J = 6.2 Hz, 3H), 2.55 (m ,1H), 2.75 (m, 1H), 2.96 (m, 1H), 3.40 (s, 2H), 4.58 (t, J = 6.9 Hz, 1H), 7.01 (q, J = 8.3 Hz, 2H), 7.31 (s, 1H), 7.59 (m, 3H), 7.90 (d, J = 7.6 Hz, 2H), 8.00 (t, J = 8.0 Hz, 3H), 11.71 (d, J = 15.8 Hz, 2H).

^{13}C NMR (300 MHz, DMSO-d_6): δ = 21.7, 28.2, 30.9, 42.4, 117.8, 118.0, 118.4, 119.9, 122.2, 124.7, 125.7, 125.9, 127.2, 127.5, 128.6, 128.7, 128.8, 130.7, 130.8, 130.9, 132.4.

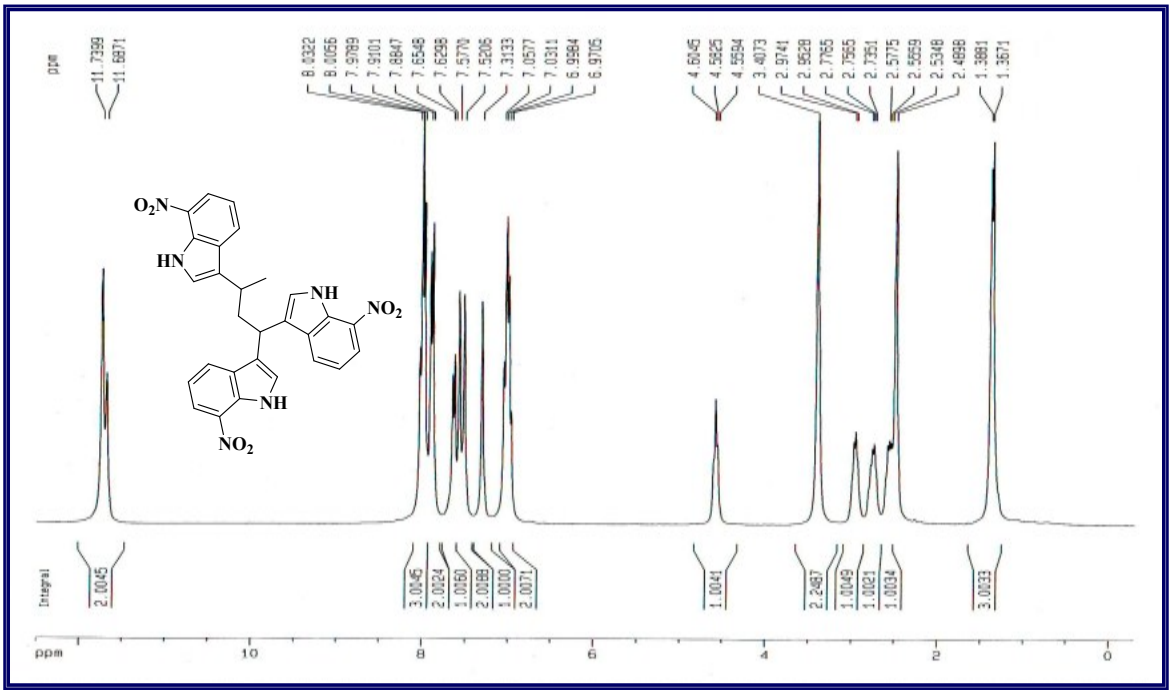
MS (EI): m/z 538 (1.9%, M^{+}), 335 (76.4), 289 (18.2), 190 (30.0), 167 (28.4), 149 (100), 57 (33.9).



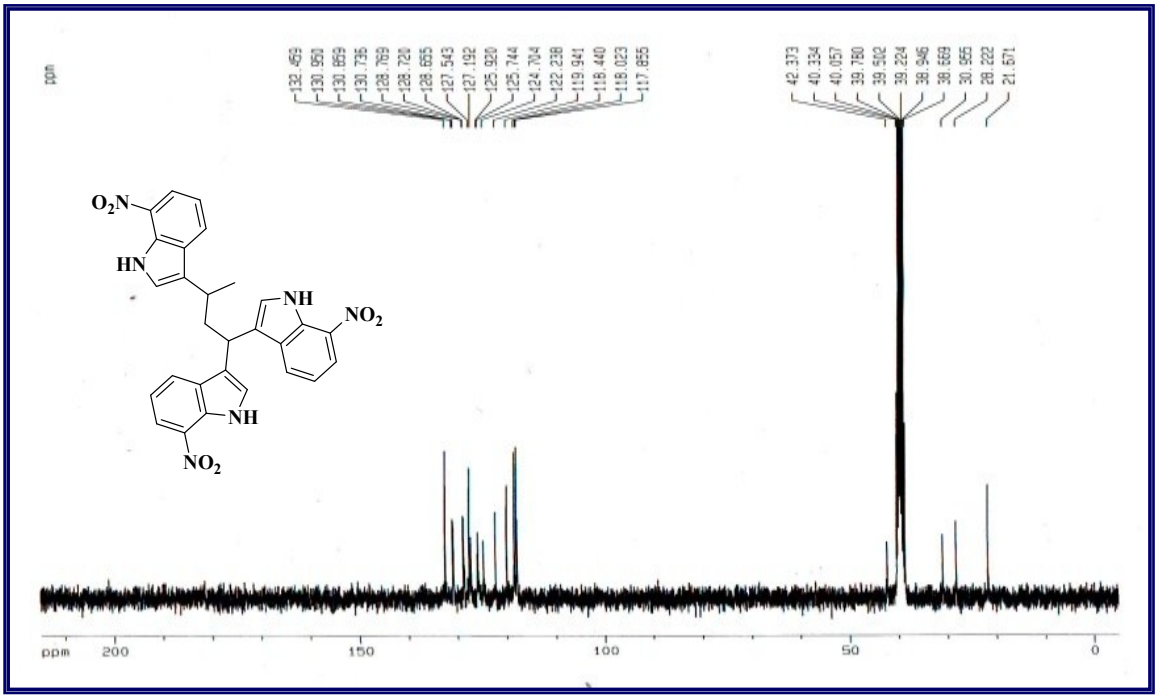
The IR spectrum of *3-(1,3-bis(7-nitro-1H-indol-3-yl)butyl)-7-nitro-1H-indole (Table 3, entry 4)*



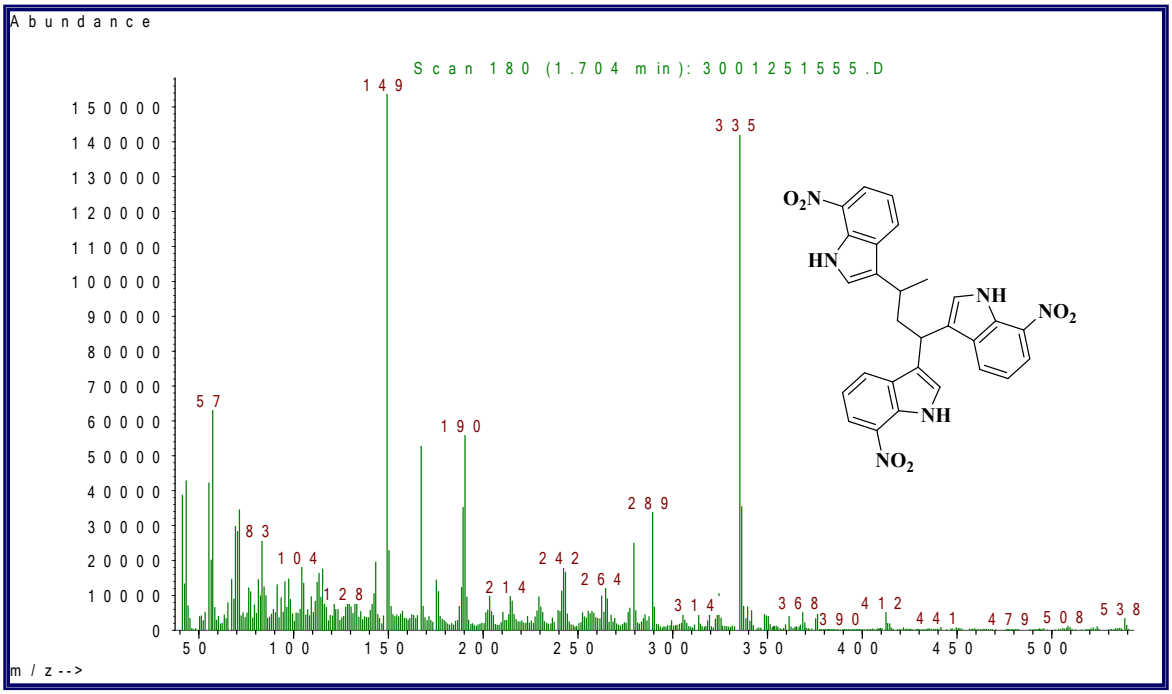
The ^{1}H NMR spectrum of *3-(1,3-bis(7-nitro-1H-indol-3-yl)butyl)-7-nitro-1H-indole (Table 3, entry 4)*



The ^{13}C NMR spectrum of *3-(1,3-bis(7-nitro-1H-indol-3-yl)butyl)-7-nitro-1H-indole (Table 3, entry 4)*



The mass spectrum of *3-(1,3-bis(7-nitro-1H-indol-3-yl)butyl)-7-nitro-1H-indole (Table 3, entry 4)*



3-(1,3-bis(7-nitro-1H-indol-3-yl)hexyl)-7-nitro-1H-indole (Table 3, entry 16)

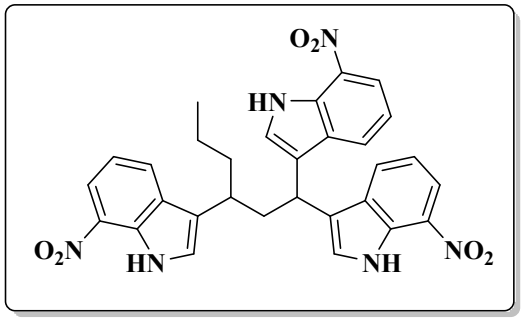
Orange solid; M.p. 129 °C; Yield: 88%.

IR(KBr): 3442, 2925, 1628, 1595, 1384, 1322, 1094, 733, 468 Cm^{-1}.

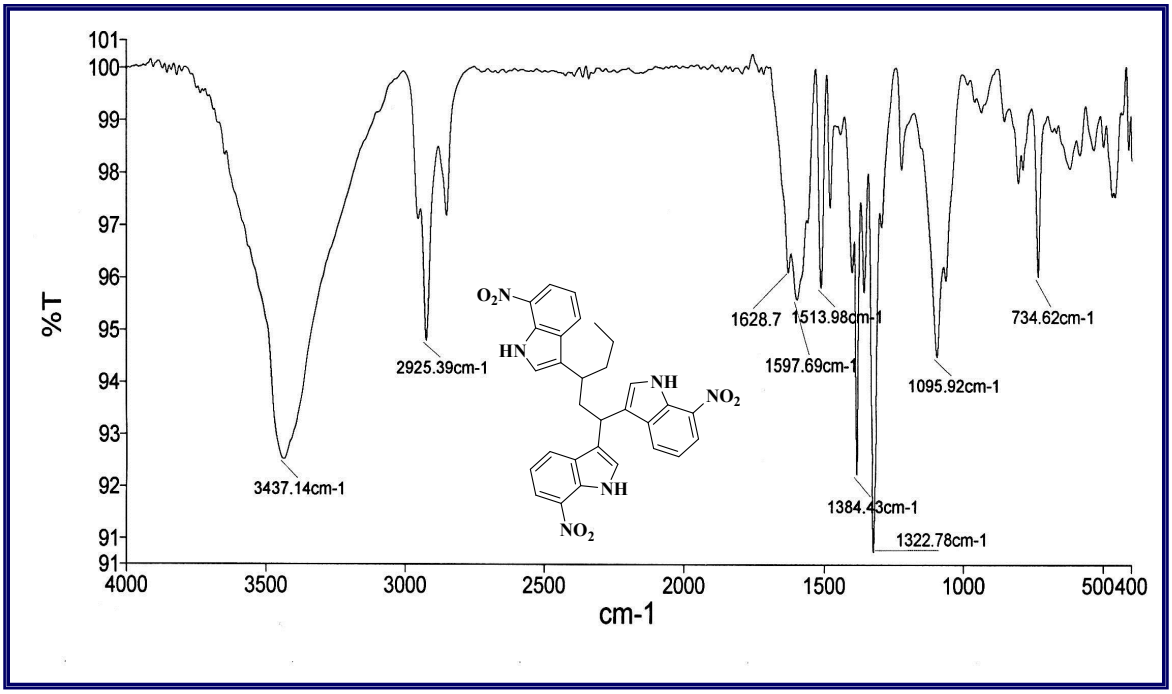
^{1}H NMR (300 MHz, DMSO-d_6): δ = 0.68 (t, J = 7.2 Hz, 3H), 1.07 (m, 2H), 1.71 (m, 2H), 2.68 (m, 2H), 2.84 (m, 1H), 3.37 (s, 2H), 4.40 (t, J = 8.0 Hz, 1H), 6.99 (m, 2H), 7.26 (s, 1H), 7.45 (d, J = 18.3 Hz, 2H), 7.73 (m, 3H), 7.99 (m, 3H), 11.71 (t, J = 15.6 Hz, 2H).

^{13}C NMR (DMSO-d_6): δ = 13.9, 20.2, 30.9, 33.8, 38.2, 40.9, 117.9, 118.0, 118.4, 119.3, 120.0, 120.6, 125.6, 126.0, 127.3, 127.5, 128.7, 130.7, 130.9, 131.3, 132.3, 132.5.

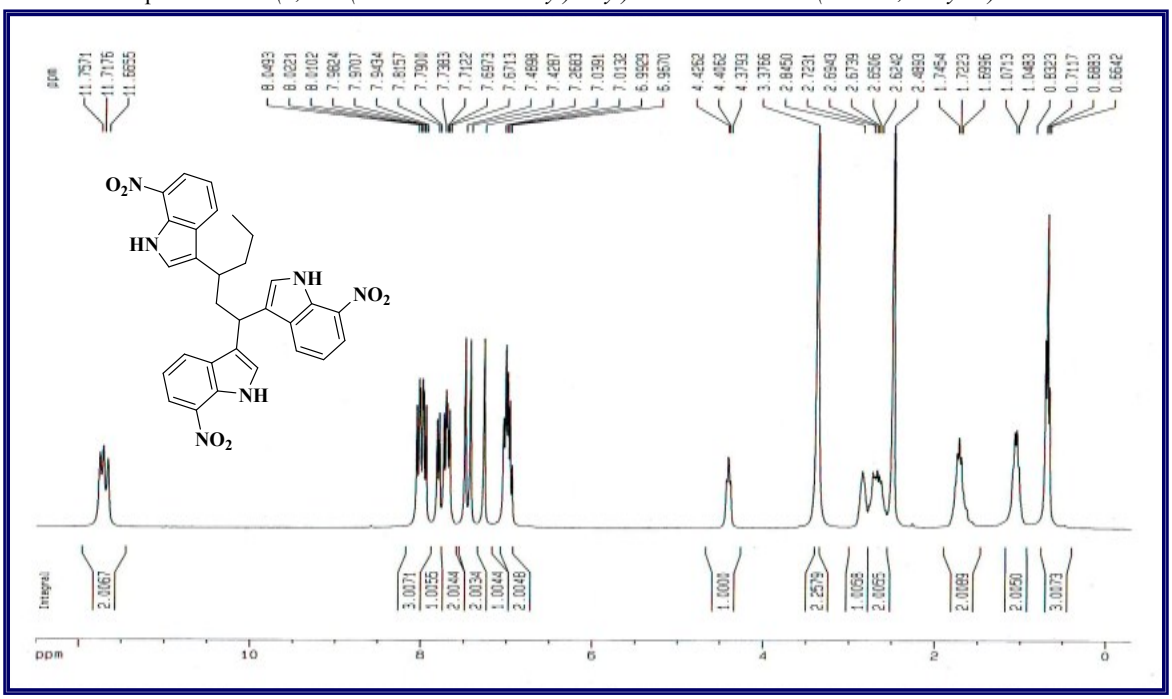
MS (EI): m/z 566 (3.7%, M^{+}), 335 (100), 289 (24.1), 218 (74.0), 175 (42.1), 129 (16.8).



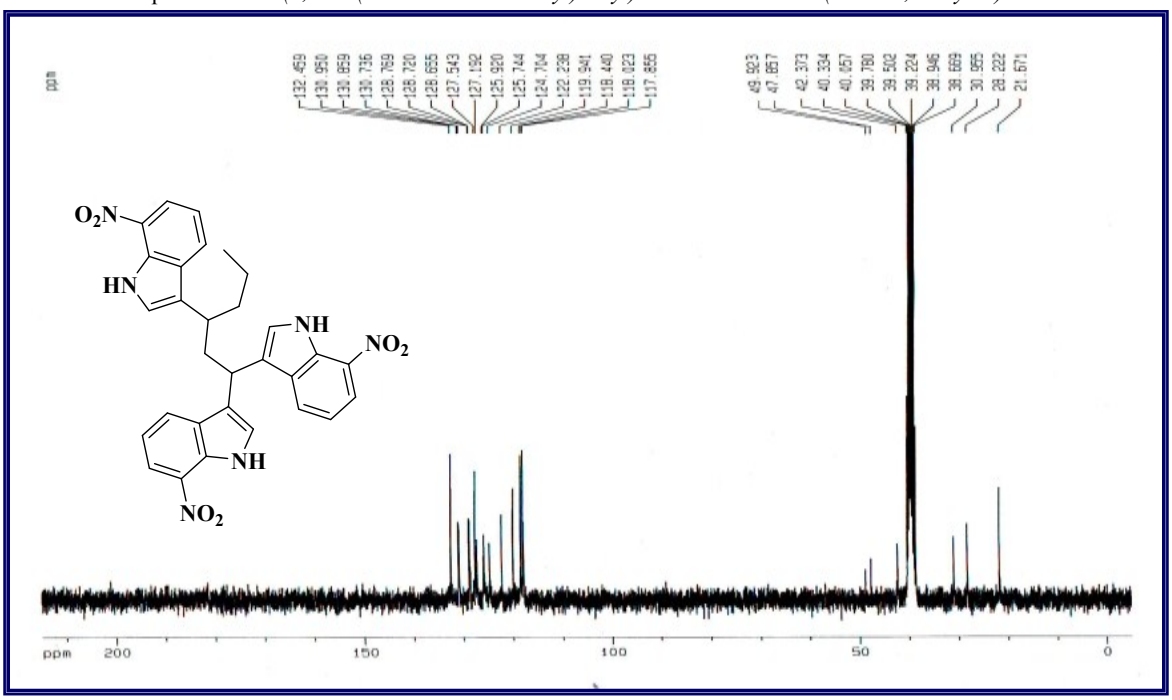
The IR spectrum of *3-(1,3-bis(7-nitro-1H-indol-3-yl)hexyl)-7-nitro-1H-indole (Table 3, entry 16)*



The ^{1}H NMR spectrum of *3-(1,3-bis(7-nitro-1H-indol-3-yl)hexyl)-7-nitro-1H-indole (Table 3, entry 16)*



The ^{13}C NMR spectrum of *3-(1,3-bis(7-nitro-1H-indol-3-yl)hexyl)-7-nitro-1H-indole (Table 3, entry 16)*



The mass spectrum of *3-(1,3-bis(7-nitro-1H-indol-3-yl)hexyl)-7-nitro-1H-indole (Table 3, entry 16)*