

Supporting Information for

Cu-EDTA-modified APTMS-Fe₃O₄@SiO₂ core-shell nanocatalyst: A novel magnetic recoverable catalyst for the Biginelli reaction

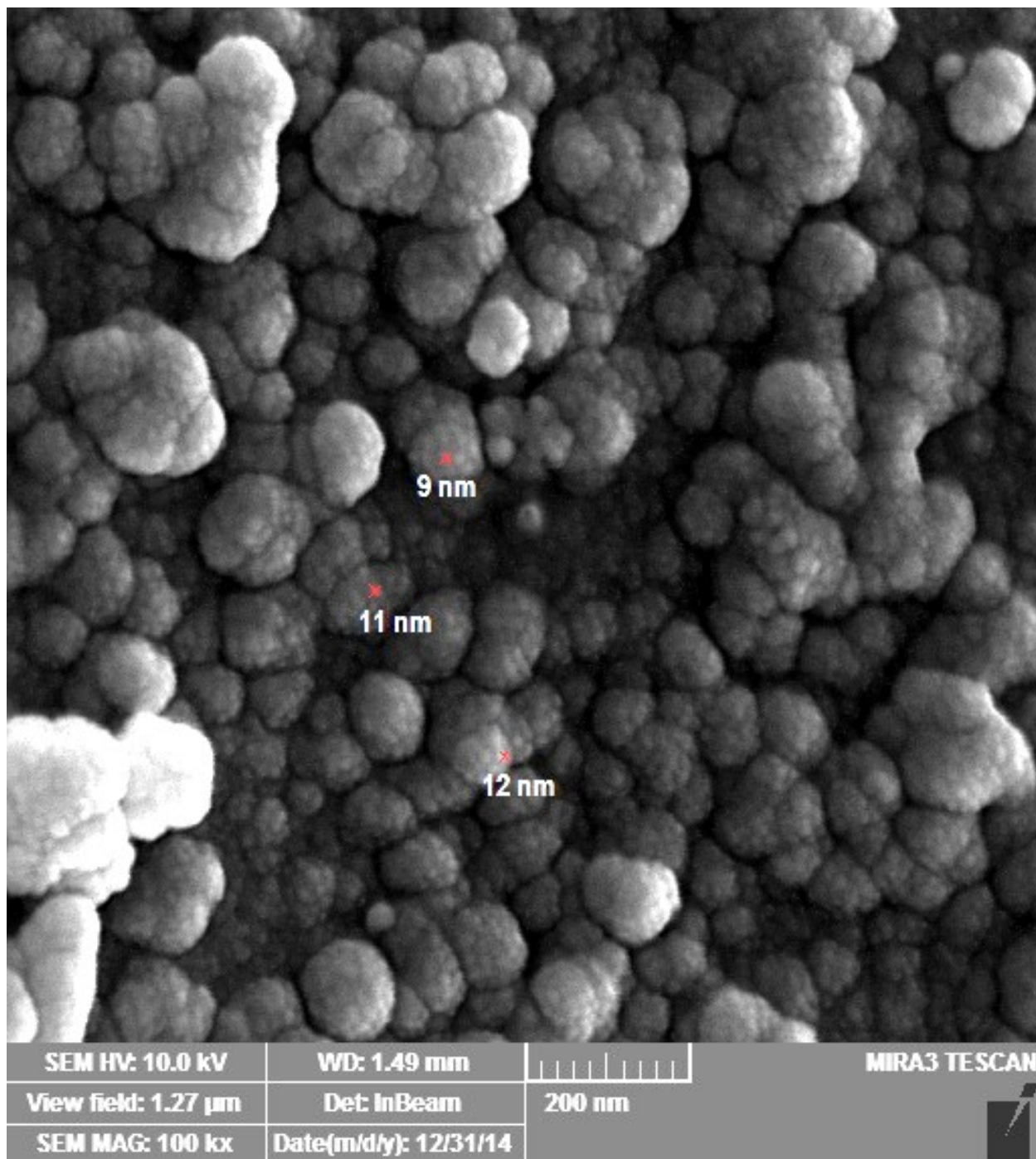
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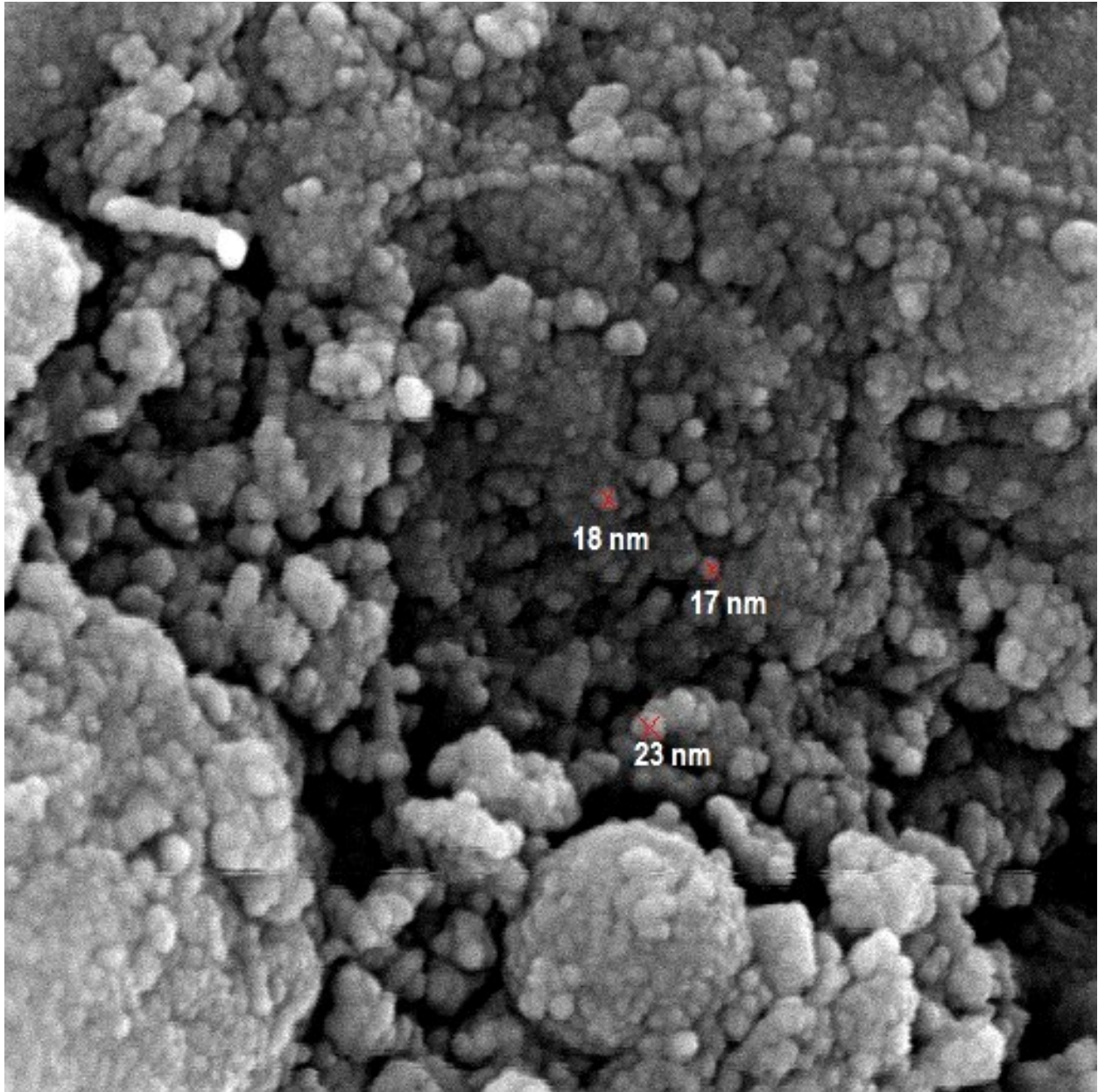
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+981333367262, Email: sheykhan@guilan.ac.ir

Table of contents:

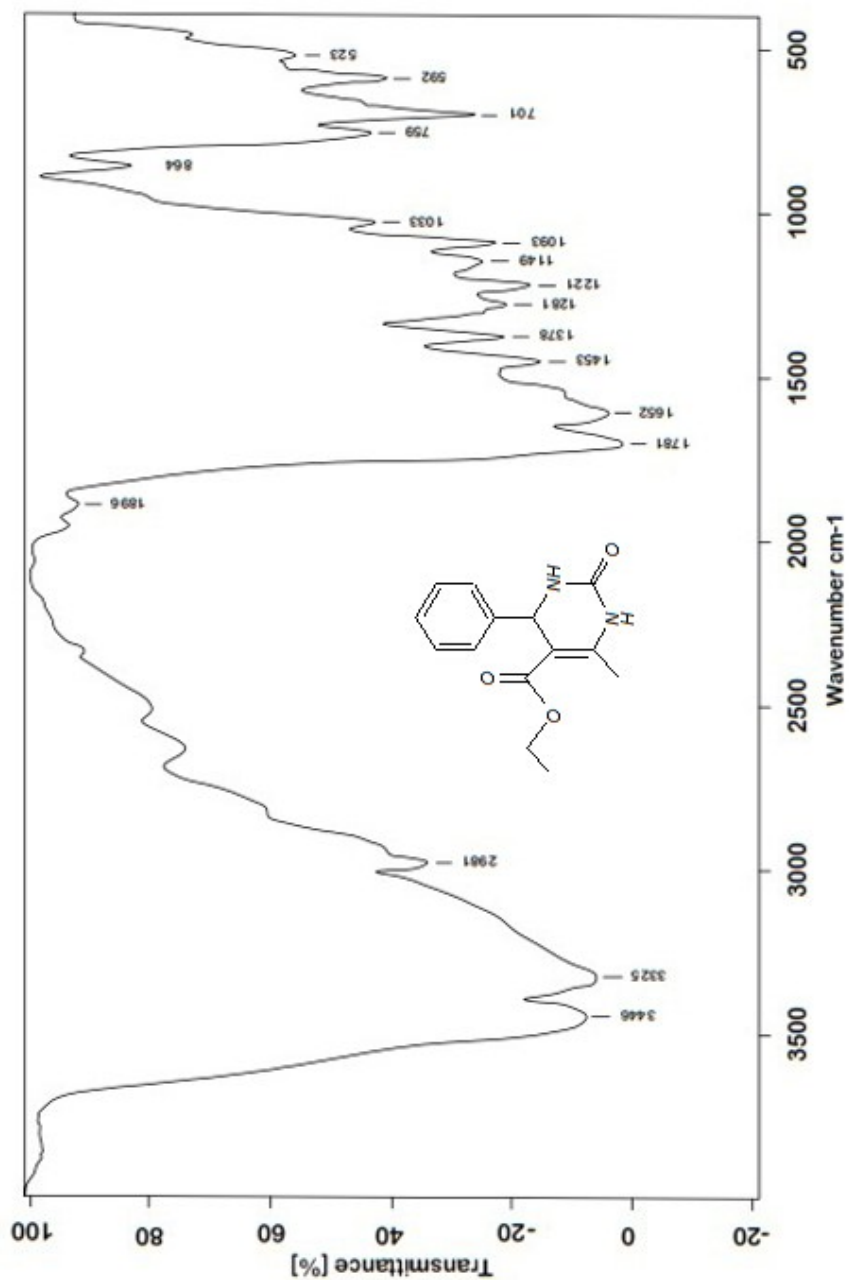
	Page
1. SEM photographs of the catalysts	S2-S3
2. Spectral data of the products	S4-S18

Scanning electron microscopy of 1 (top) and 3 (down)



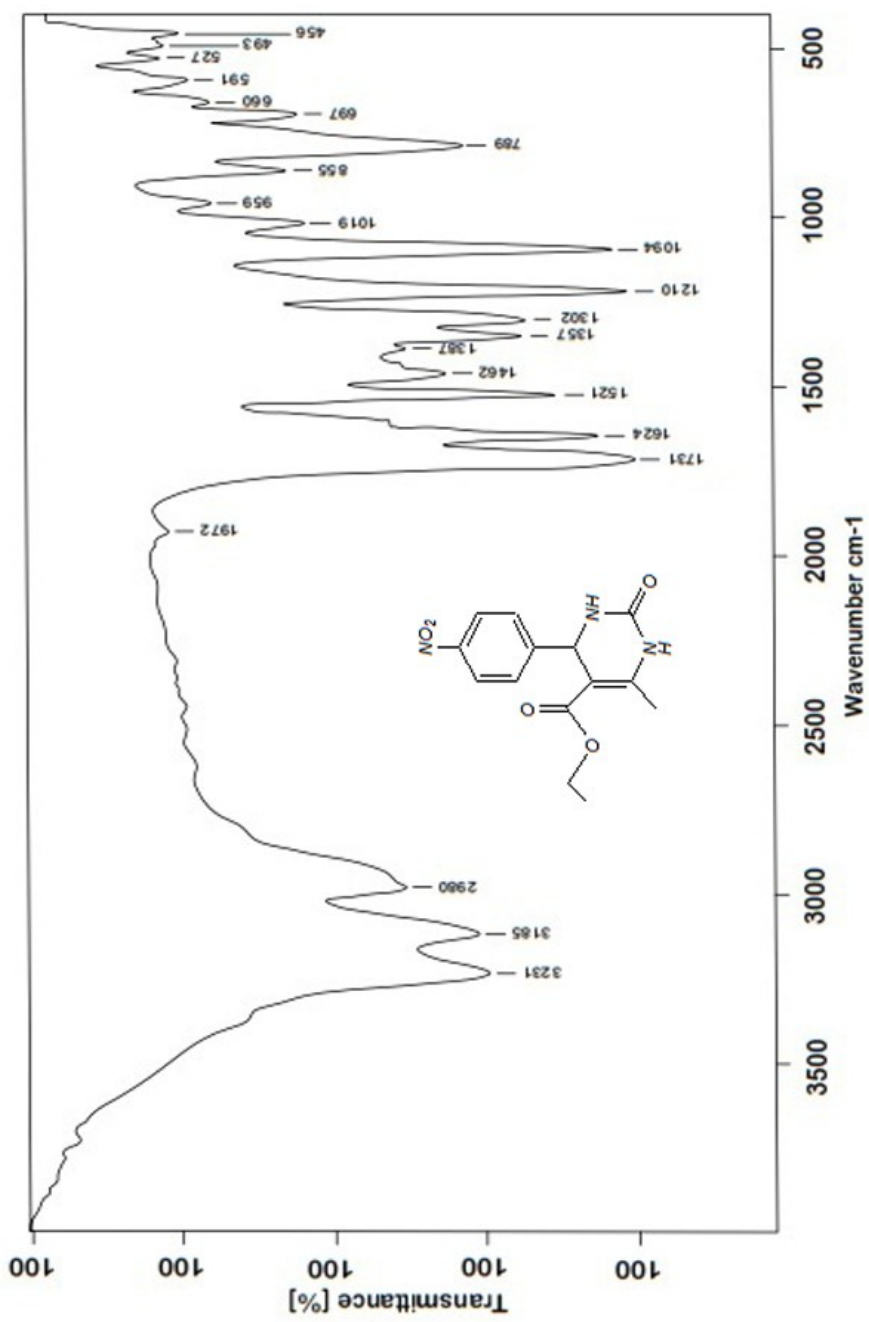


SEM HV: 10.0 kV	WD: 1.50 mm	 200 nm	MIRA3 TESCAN
View field: 1.27 μ m	Det: InBeam		
SEM MAG: 100.0 kx	Date(m/d/y): 12/31/14		

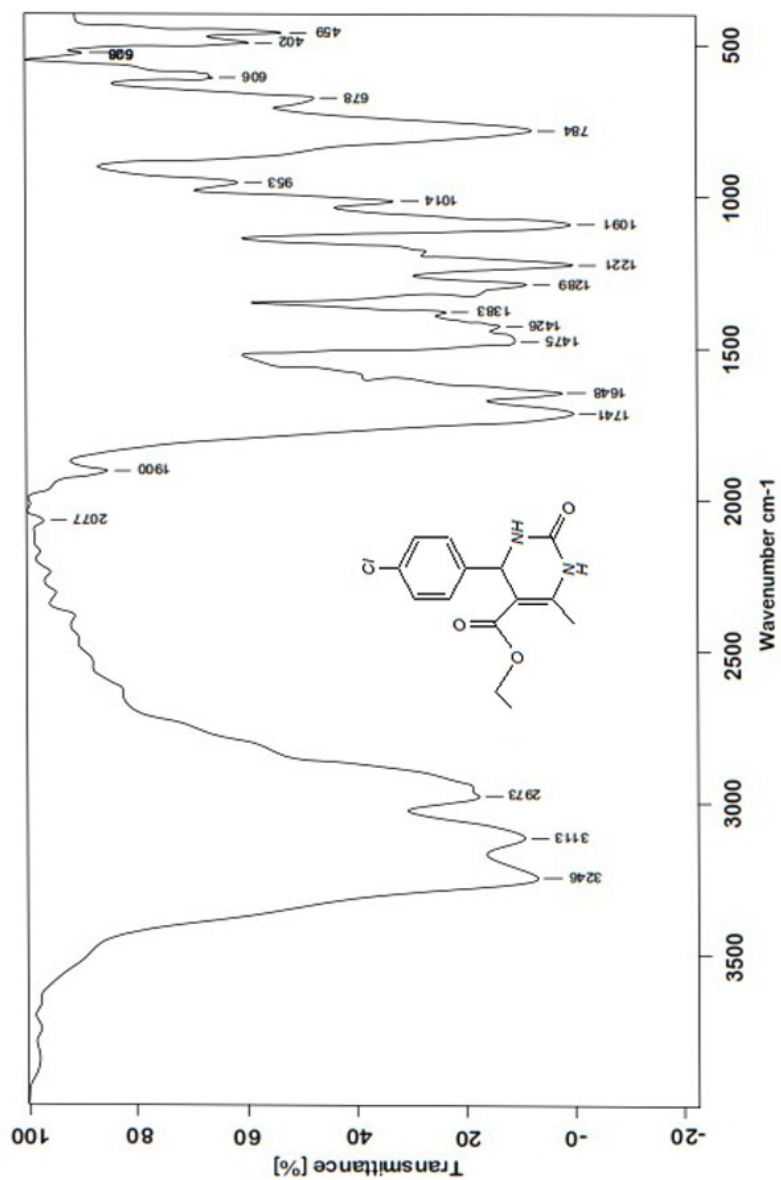


Observed mp: 198-200 °C (literature: 200-202 °C)

¹H NMR (400 MHz, DMSO): δ 9.15 (s, 1H); 7.70 (s, 1H); 7.30-7.20 (m, 5H); 5.12 (s, 1H); 3.96 (q, J = 7.2, 2H); 2.23 (s, 3H); 1.07 (t, J = 7.2, 3H).

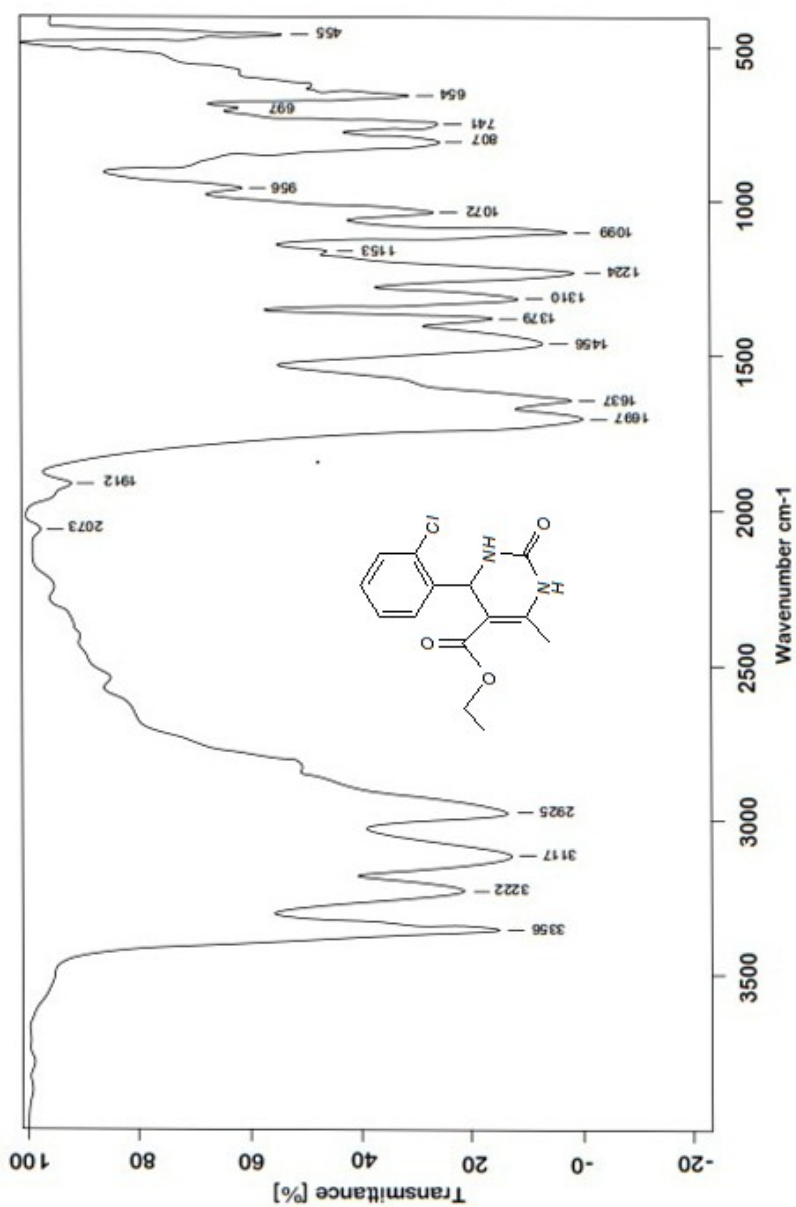


Observed mp: 204-206 °C (literature: 203-205 °C)



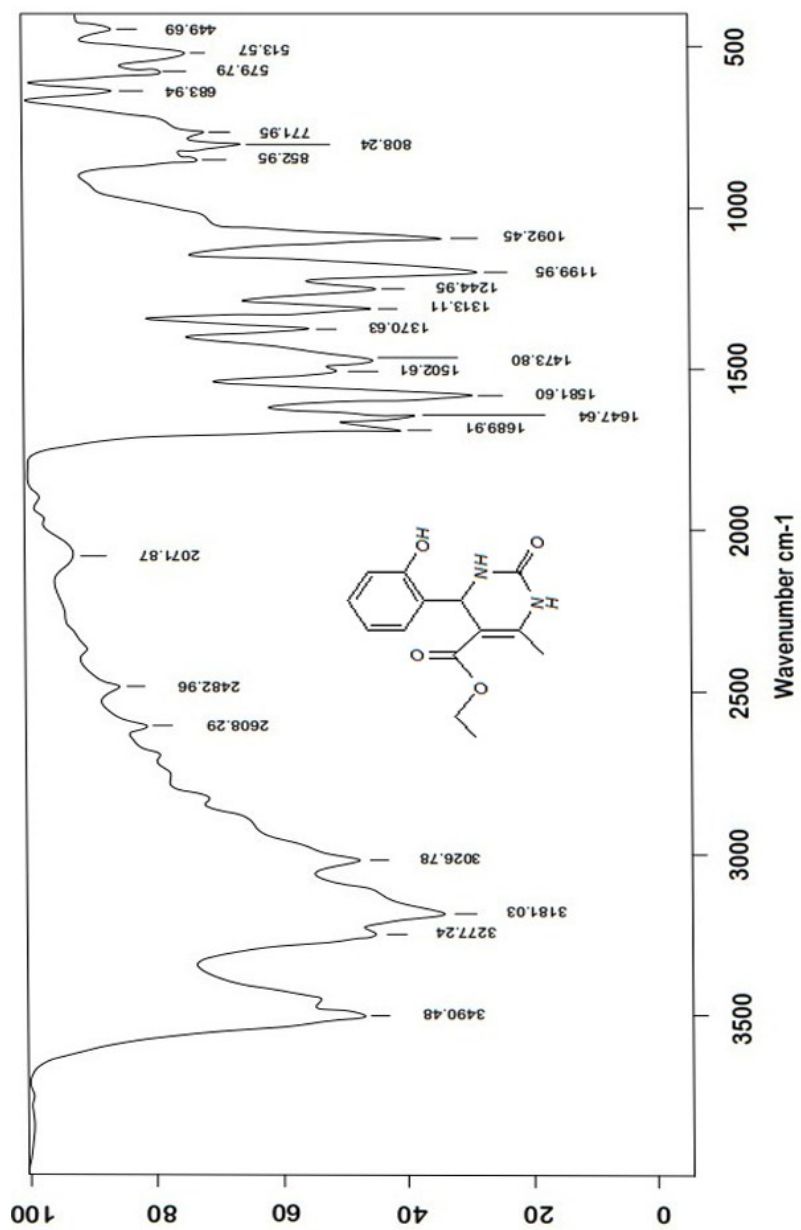
Observed mp: 207-209 °C (literature: 208-210 °C)

^1H NMR (400 MHz, DMSO): δ = 9.20 (s, 1H); 7.72 (s, 1H); 7.37 (d, J = 8.3 Hz, 2H); 7.23 (d, J = 8.8 Hz, 2H); 5.12 (s, 1H); 3.96 (q, J = 7.2 Hz, 2H); 2.23 (s, 3H); 1.06 (t, J = 7.2 Hz, 3H).

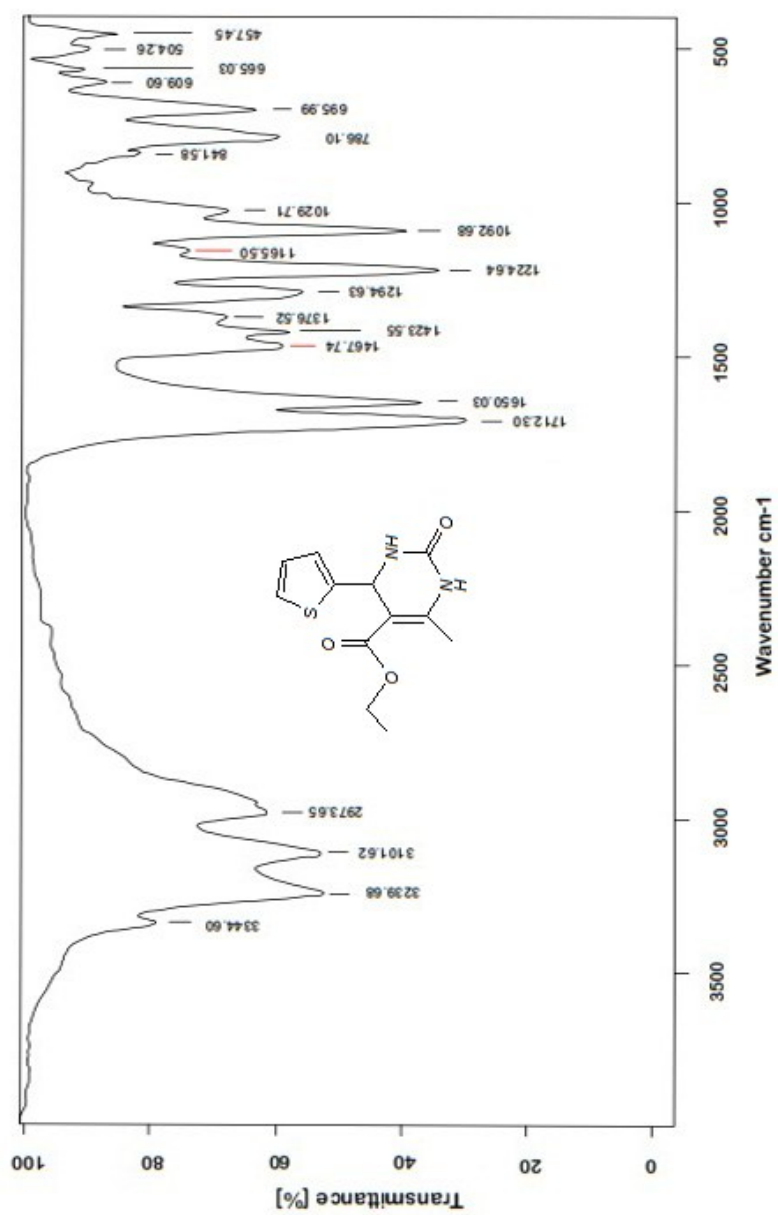


Observed mp: 216-218 °C (literature: 217-220 °C)

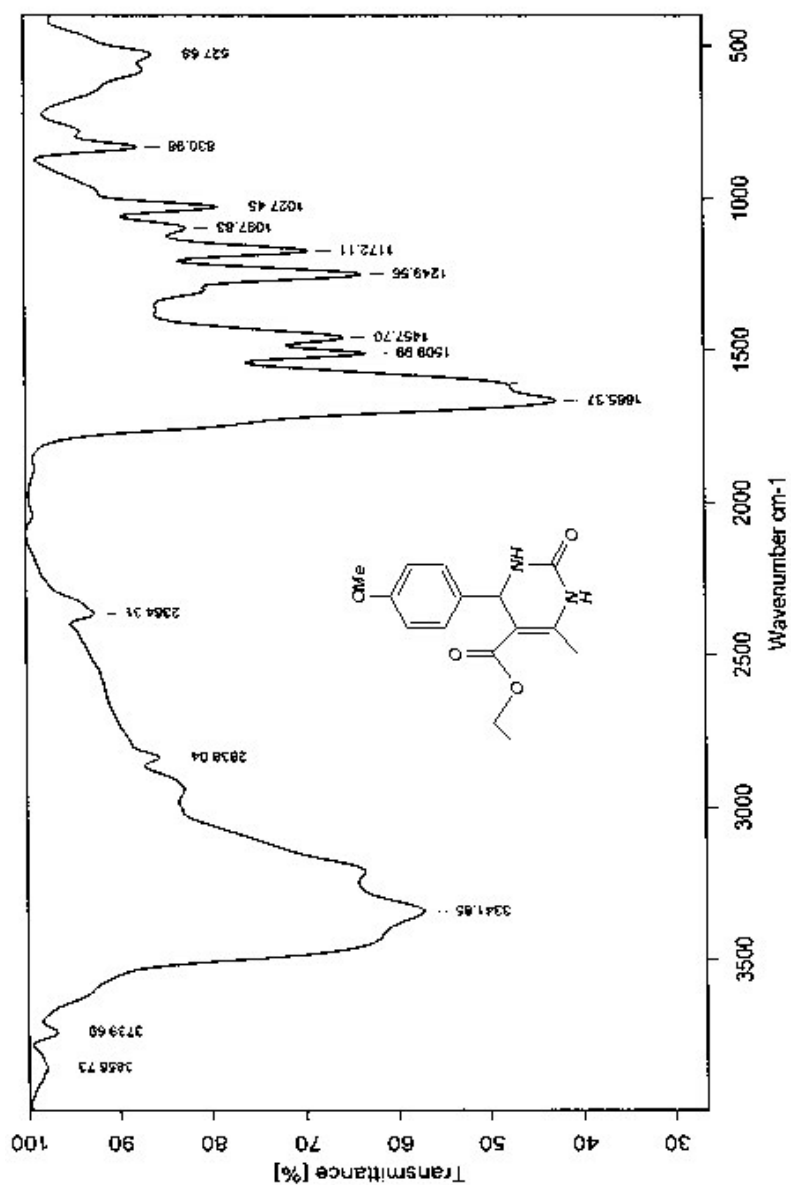
¹H NMR (400 MHz, DMSO): δ 7.48 (s, 1H), 7.37-7.39 (m, 1H), 7.26-7.21 (m, 3H), 5.90 (s, 1H), 4.02 (q, J = 7.2 Hz, 2H), 2.45 (s, 3H), 1.06 (t, J = 7.2 Hz, 3H).



Observed mp: 214-216 °C (literature: 217-218 °C)

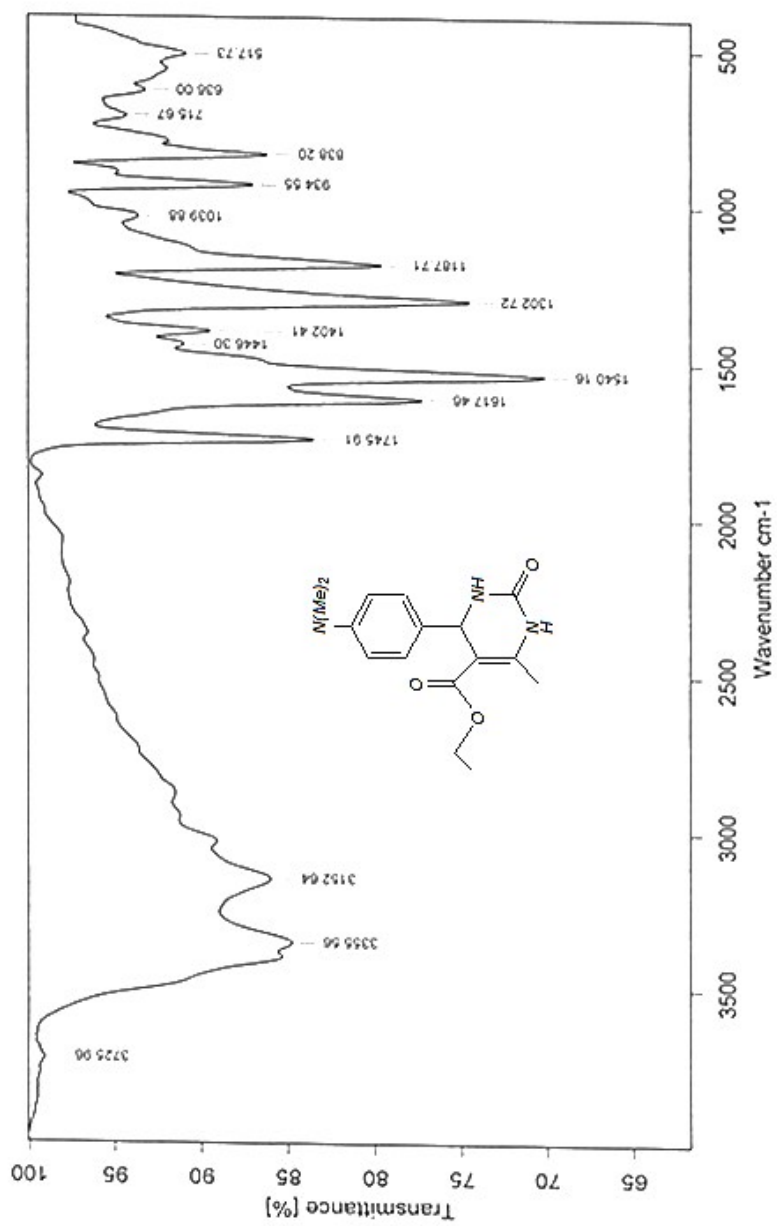


Observed mp:214-216 °C (literature: 215-217 °C)

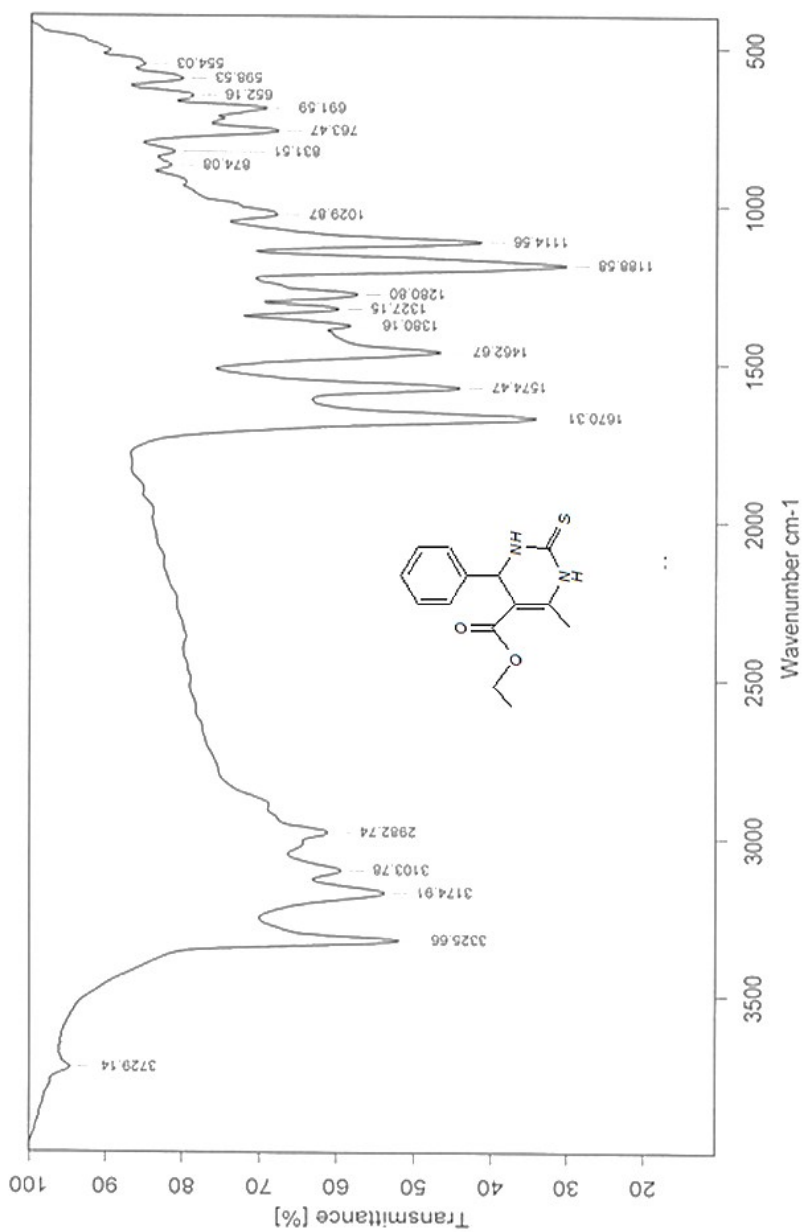


Observed mp: 192-194 °C (literature: 194-196 °C)

¹H NMR (400MHz, DMSO): δ 9.13 (s, 1H), 7.14 (d, J = 8.8Hz, 2H), 6.87 (d, J = 8.8 Hz, 3H), 5.09 (s, 1H), 4.00 (q, J = 7.1 Hz, 2H), 3.70 (s, 3H), 2.50 (s, 3H), 1.10 (t, J = 7.1 Hz, 3H).

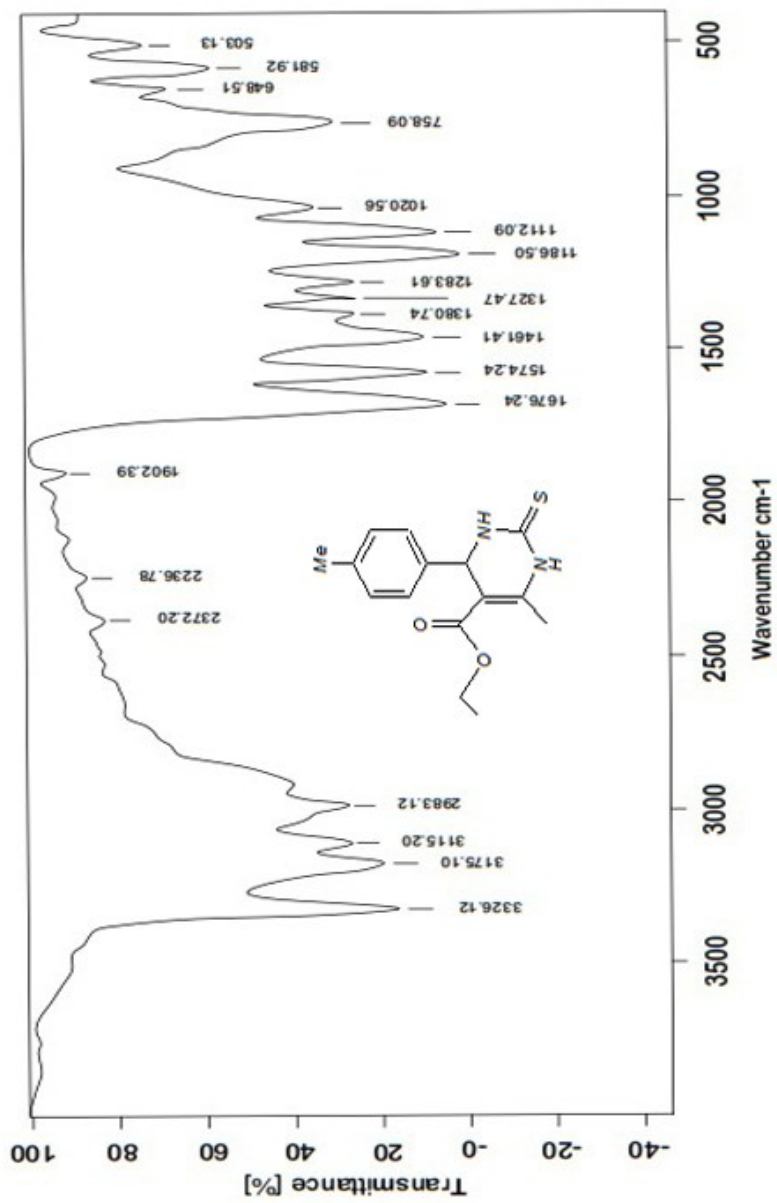


Observed mp: 256-258 °C (literature: 257-259 °C)

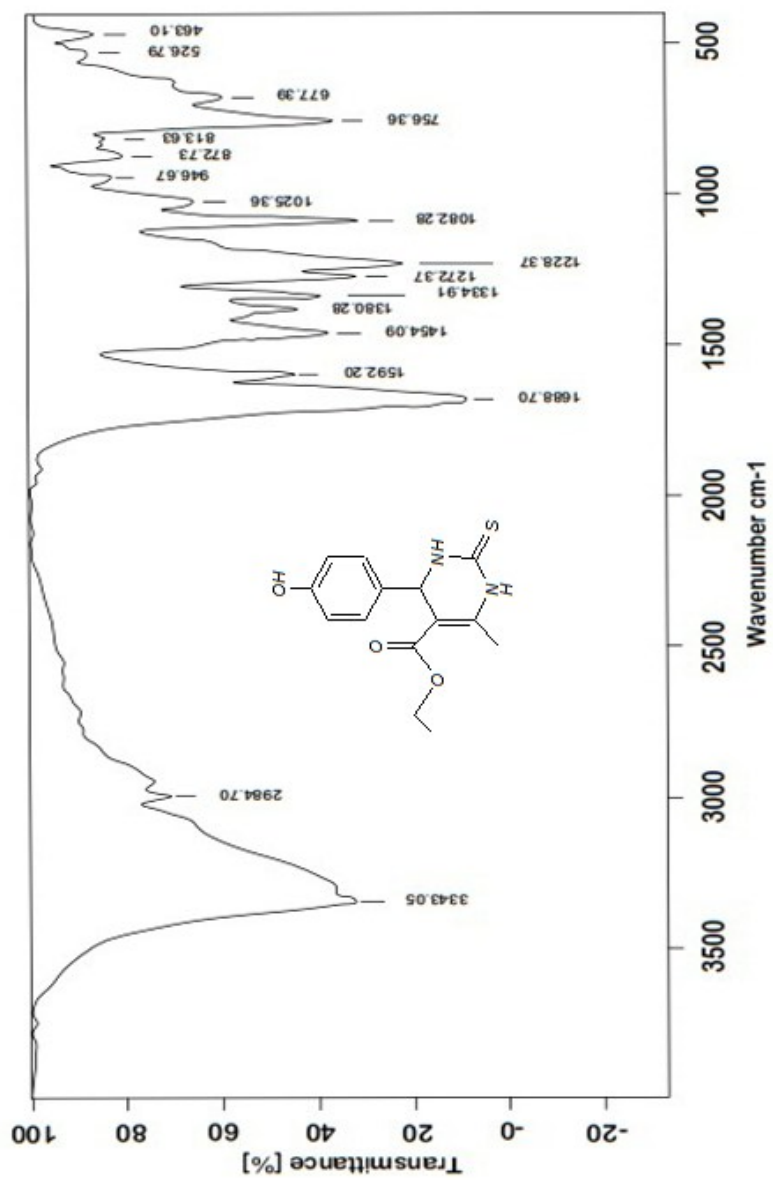


Observed mp: 207-209 °C (literature: 205-207 °C)

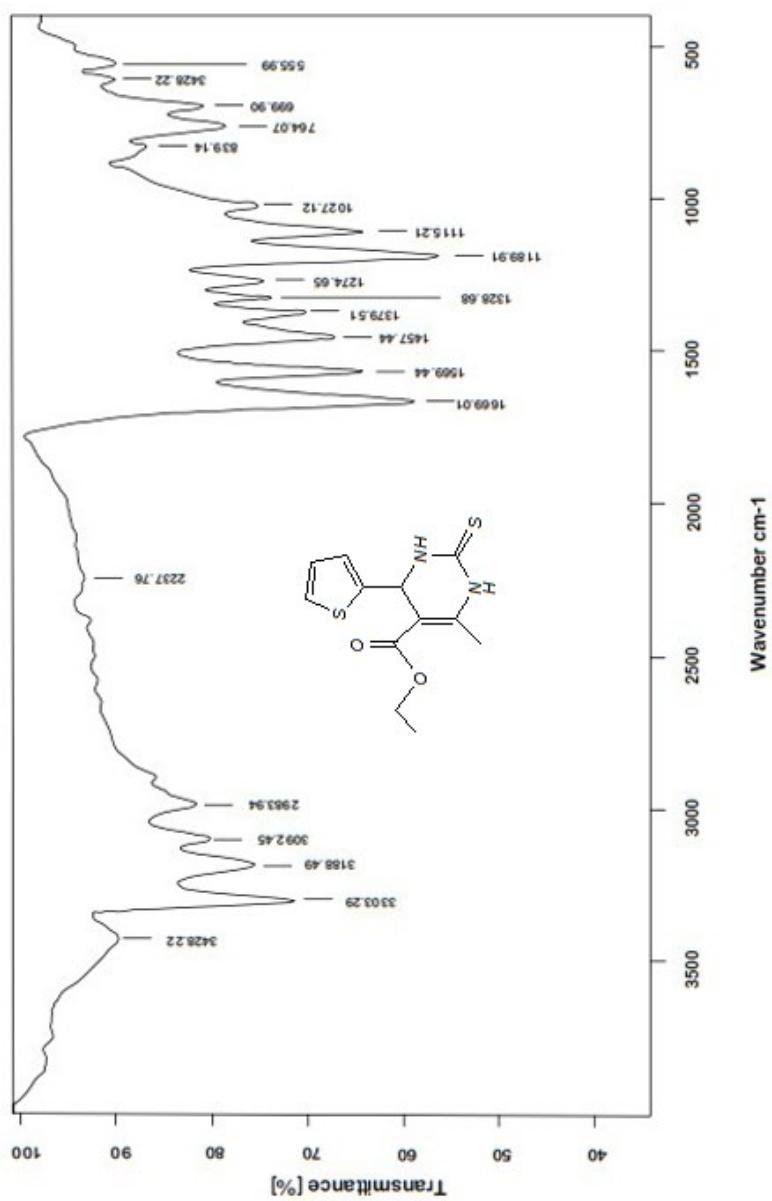
¹H NMR (400 MHz, DMSO) δ 10.36 (s, 1H), 9.69 (s, 1H), 7.56-7.07 (m, 5H), 5.17 (s, 1H), 4.00 (q, J = 6.8 Hz, 2H), 2.28 (s, 3H), 1.08 (t, J = 6.8 Hz, 3H).



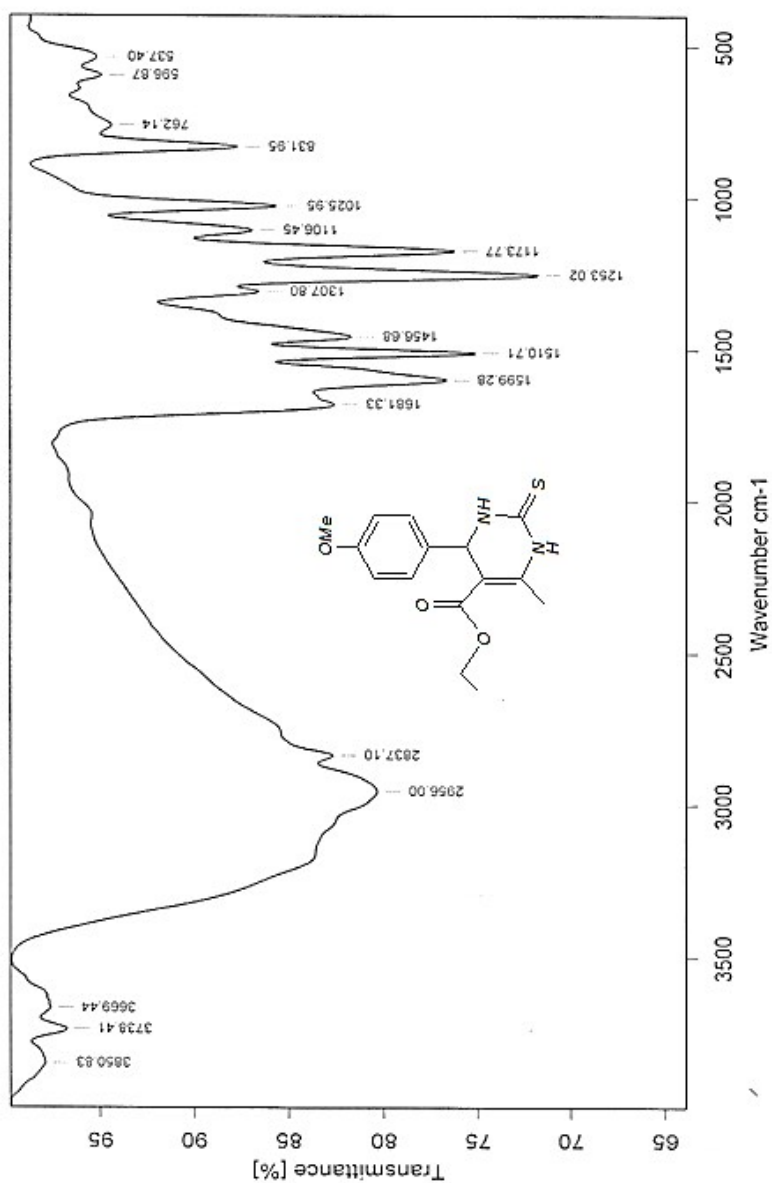
Observed mp:190-191 °C (literature: 192-193 °C)



Observed mp: 202-204 °C (literature: 202-204 °C)

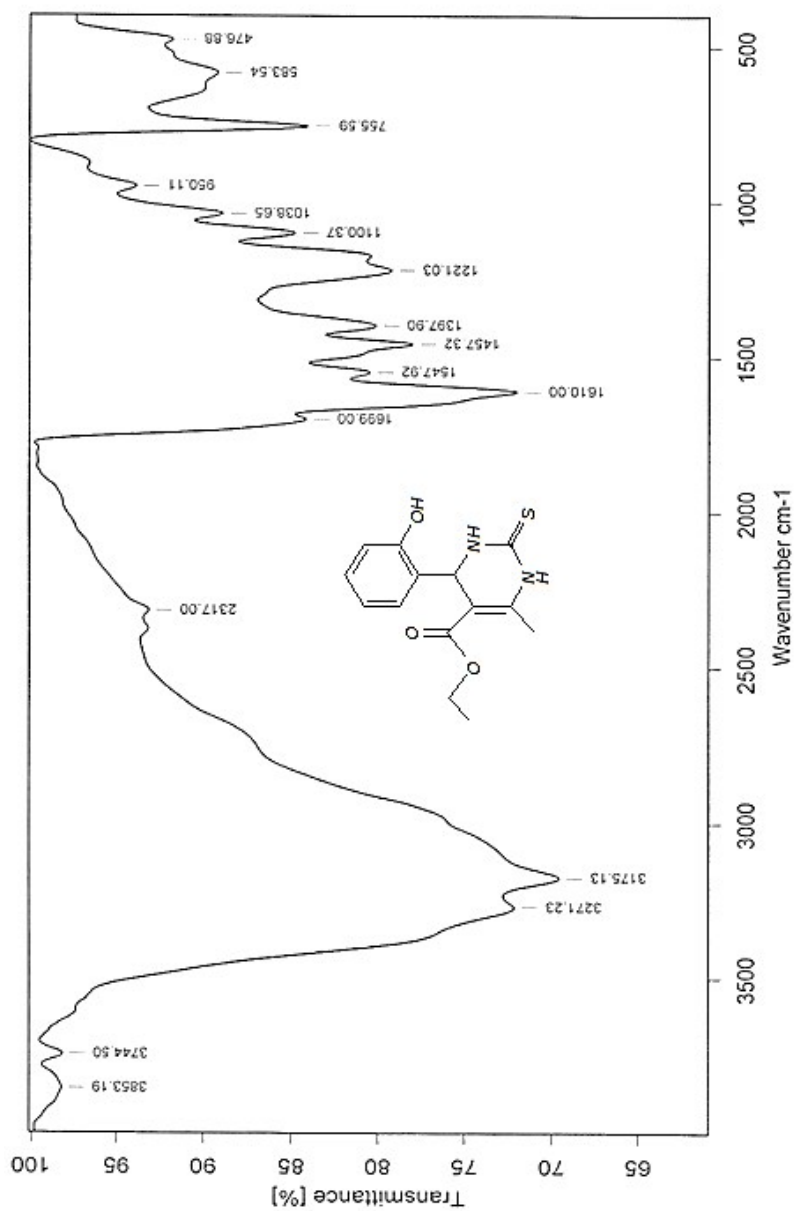


Observed mp: 214-215 °C (literature: 215-216 °C)

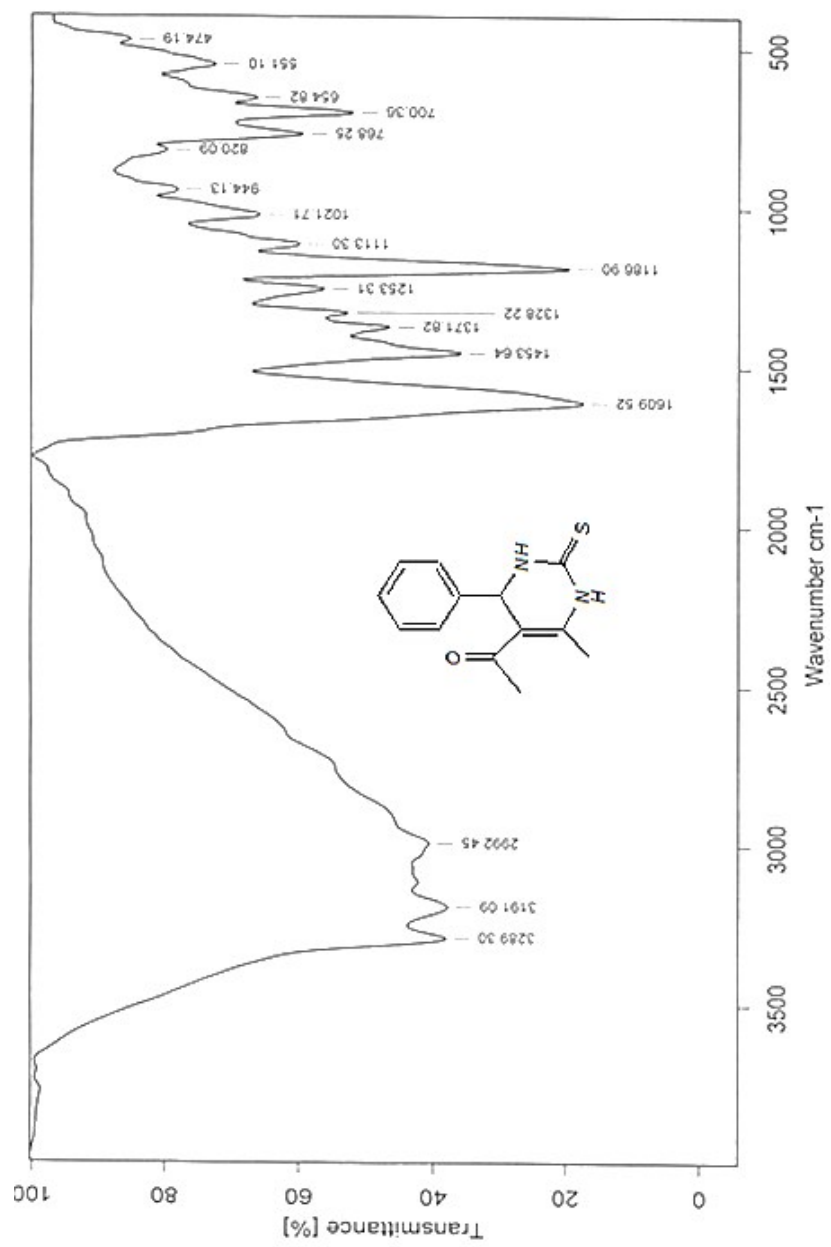


Observed mp: 149-151 °C (literature: 151-153 °C)

¹H NMR (400 MHz, DMSO) δ 10.31 (s, 1H), 9.62 (s, 1H), 7.13 (d, J = 7.9 Hz, 2H), 6.89 (d, J = 7.8 Hz, 2H), 5.10 (s, 1H), 3.98 (q, J = 6.5 Hz, 2H), 3.71 (s, 3H), 2.27 (s, 3H), 1.10 (t, J = 6.5 Hz, 3H)



Observed mp: 198-200 °C (literature: 200-201 °C)



Observed mp: 223-225 °C (literature: 220-222 °C)