

# Supporting Information

## **Magnetic core shell titanium dioxide nanoparticles as efficient catalyst for domino Knoevenagel-Michael-cyclocondensation reaction of malononitrile, various aldehydes and dimedone**

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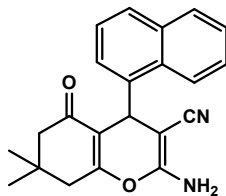
<sup>b</sup>*Department of Chemistry, University of Sayyed Jamaledin Asadabadi, Asadabad, 6541835583, Iran.*

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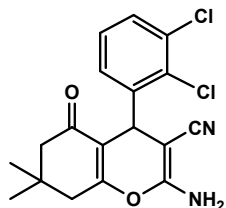
## Selected data of compounds

### 2-amino-7,7-dimethyl-4-(naphthalen-1-yl)-5-oxo-5,6,7,8-tetrahydro-4H-chromene-3-carbonitrile



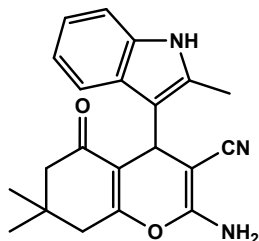
Mp: 215-218 °C; IR (KBr,  $\text{cm}^{-1}$ ): 3427, 3319, 2184, 1680, 1374, 1141, 1032.  $^1\text{H}$  NMR (400 MHz,  $\text{DMSO}-d_6$ ):  $\delta$  (ppm) 0.99 (s, 3H), 1.09 (s, 3H), 2.67 (d,  $J = 16.0$  Hz, 1H), 2.24 (d,  $J = 16.0$  Hz, 1H), 2.54 (Distorted AB System, 2H), 5.14 (s, 1H), 6.97 (s, 2H), 7.23 (d,  $J = 6.4$  Hz, 1H), 7.43-7.58 (m, 3H), 7.77 (d,  $J = 8$  Hz, 1H), 7.91 (d,  $J = 8$  Hz, 1H), 8.37 (d,  $J = 8$  Hz, 1H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{DMSO}-d_6$ ):  $\delta$  (ppm) 27.43, 28.84, 30.85, 32.29, 50.46, 59.35, 113.88, 120.59, 124.07, 125.65, 126.06, 126.12, 126.27, 127.42, 128.84, 131.20, 133.79, 142.37, 158.89, 163.23, 196.19.

### 2-amino-4-(2,3-dichlorophenyl)-7,7-dimethyl-5-oxo-5,6,7,8-tetrahydro-4H-chromene-3-carbonitrile



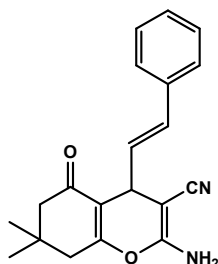
Mp: 260-263 °C; IR (KBr,  $\text{cm}^{-1}$ ): 3448, 3252, 2192, 1680, 1372, 1155, 1037.  $^1\text{H}$  NMR (400 MHz,  $\text{DMSO}-d_6$ ):  $\delta$  (ppm) 0.98 (s, 3H), 1.05 (s, 3H), 2.05 (d,  $J = 16.0$  Hz, 1H), 2.25 (d,  $J = 16.4$  Hz, 1H), 2.51 (Distorted AB System, 2H), 4.78 (s, 1H), 7.10 (s, 2H), 7.16 (d,  $J = 7.6$  Hz, 1H), 7.30 (t,  $J = 7.6$  Hz, 1H), 7.49 (t,  $J = 6.4$  Hz, 1H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{DMSO}-d_6$ ):  $\delta$  (ppm) 27.44, 28.86, 32.26, 34.20, 50.34, 56.81, 112.90, 119.57, 128.74, 128.96, 129.25, 130.65, 132.25, 144.84, 159.16, 163.80, 196.15.

**2-amino-7,7-dimethyl-4-(2-methyl-1H-indol-3-yl)-5-oxo-5,6,7,8-tetrahydro-4H-chromene-3-carbonitrile**



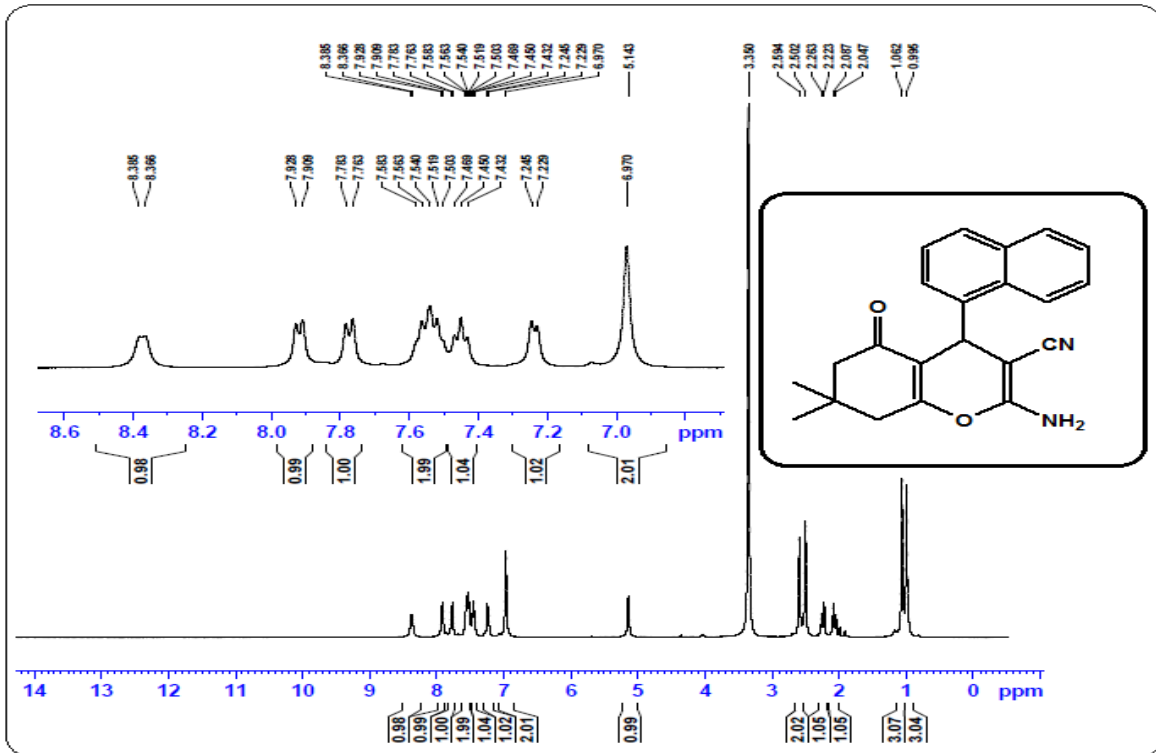
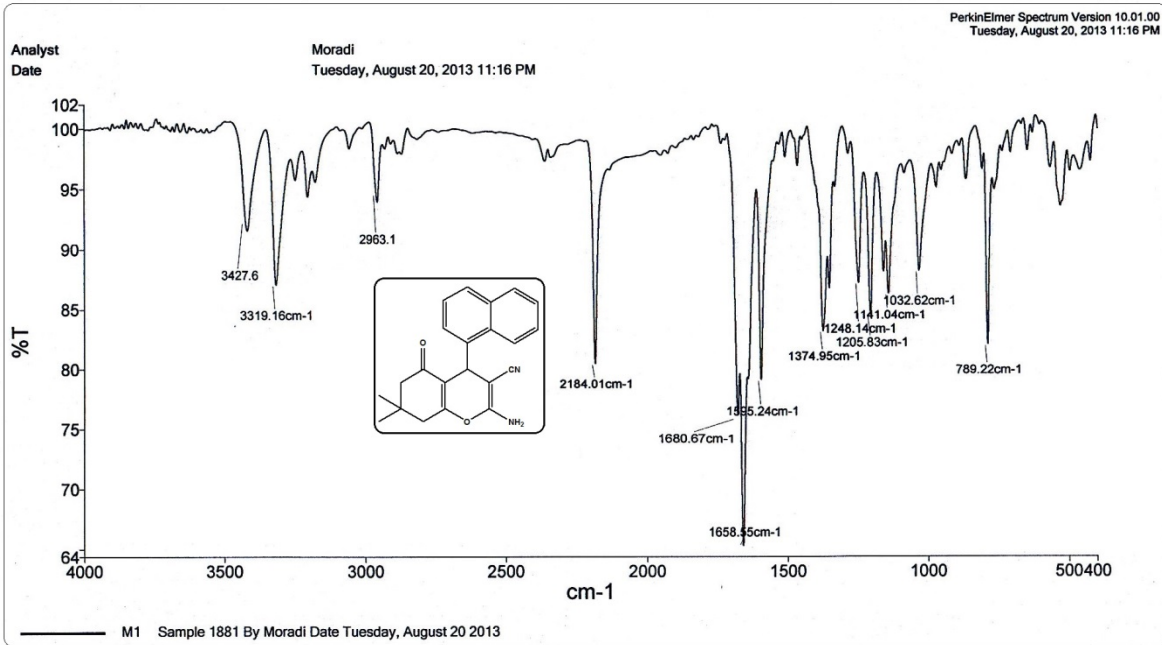
Mp: 248-250 °C; IR (KBr,  $\text{cm}^{-1}$ ): 3382, 3320, 3209, 2191, 1681, 1367, 1213, 1035.  $^1\text{H}$  NMR (400 MHz,  $\text{DMSO}-d_6$ ):  $\delta$  (ppm) 0.94 (s, 3H), 1.03 (s, 3H), 2.07 (d,  $J = 16.0$  Hz, 1H), 2.23 (d,  $J = 16.0$  Hz, 1H), 2.48 (Distorted AB System, 2H), 3.35 (s, 3H), 4.04 (s, 1H), 6.62 (d,  $J = 8$  Hz, 2H), 6.89 (s, 2H), 6.94 (d,  $J = 8.4$  Hz, 2H), 12.29 (s, 1H).

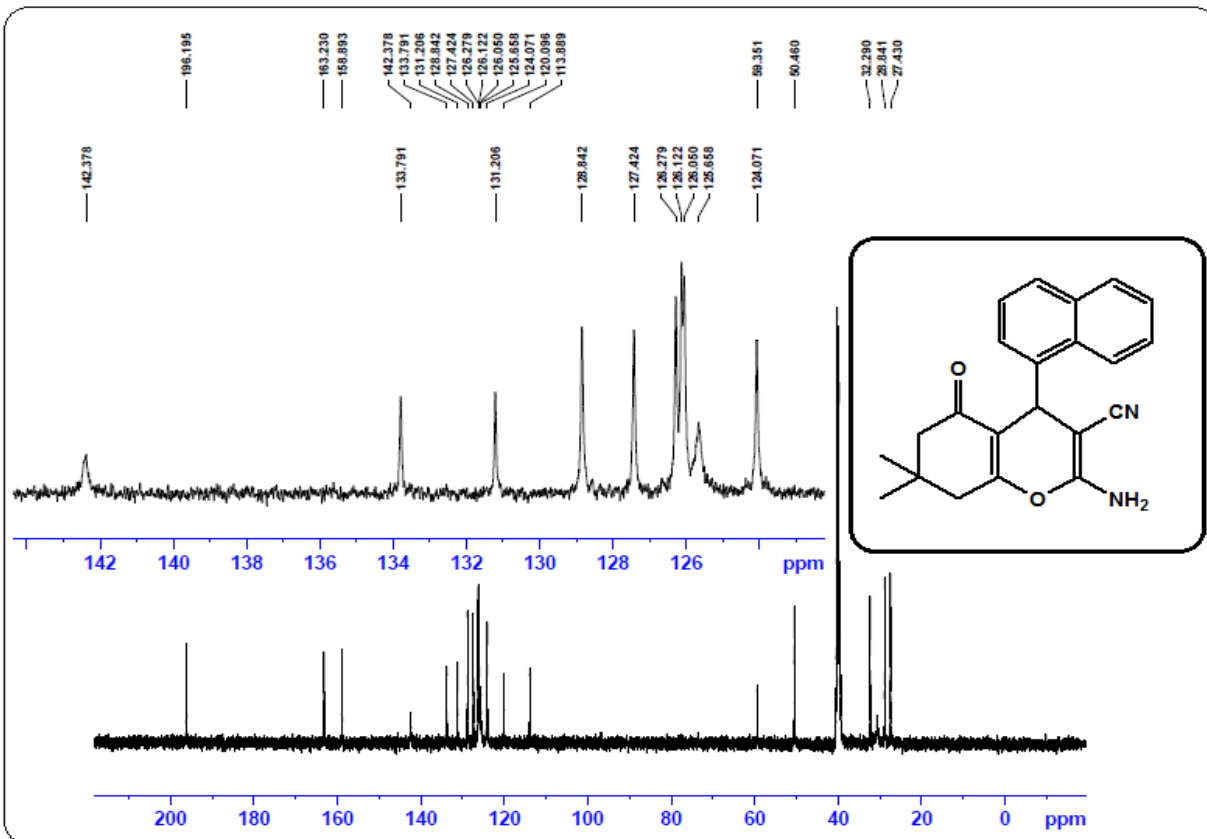
**(E)-2-amino-7,7-dimethyl-5-oxo-4-styryl-5,6,7,8-tetrahydro-4H-chromene-3-carbonitrile**



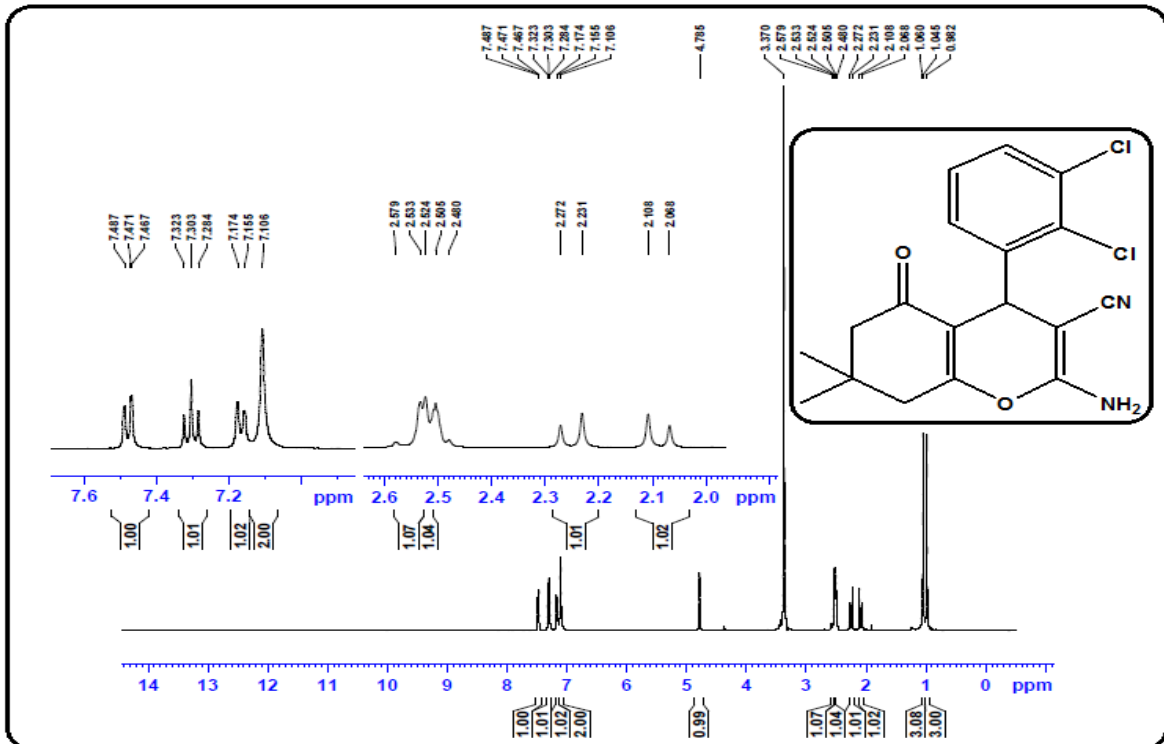
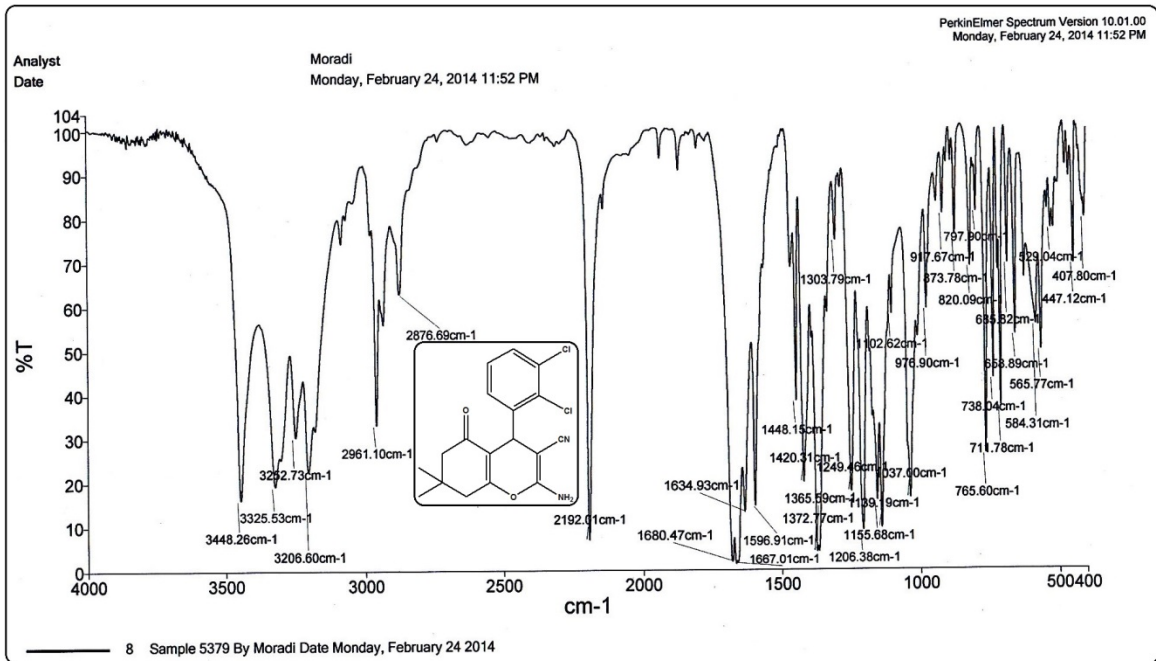
Mp: 215-218 °C; IR (KBr,  $\text{cm}^{-1}$ ): 3385, 3295, 2184, 1680, 1374, 1216, 1037.  $^1\text{H}$  NMR (400 MHz,  $\text{DMSO}-d_6$ ):  $\delta$  (ppm) 1.00 (s, 3H), 1.03 (s, 3H), 2.21 (d,  $J = 16.0$  Hz, 1H), 2.28 (d,  $J = 16.0$  Hz, 1H), 2.43 (Distorted AB System, 2H), 3.81 (d,  $J = 7.2$  Hz, 1H), 6.36 (dd,  $J=8,8$  1H), 8.36 (d,  $J = 15.6$  Hz, 1H), 7.06 (s, 2H), 7.21 (t,  $J = 7.2$  Hz, 1H), 7.29 (t,  $J = 7.2$  Hz, 2H), 7.37 (t,  $J = 7.2$  Hz, 2H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{DMSO}-d_6$ ):  $\delta$  (ppm) 27.40, 28.67, 32.29, 33.25, 50.56, 55.66, 112.34, 120.36, 126.67, 127.88, 129.05, 129.72, 131.58, 136.94, 159.75, 162.89, 196.37.

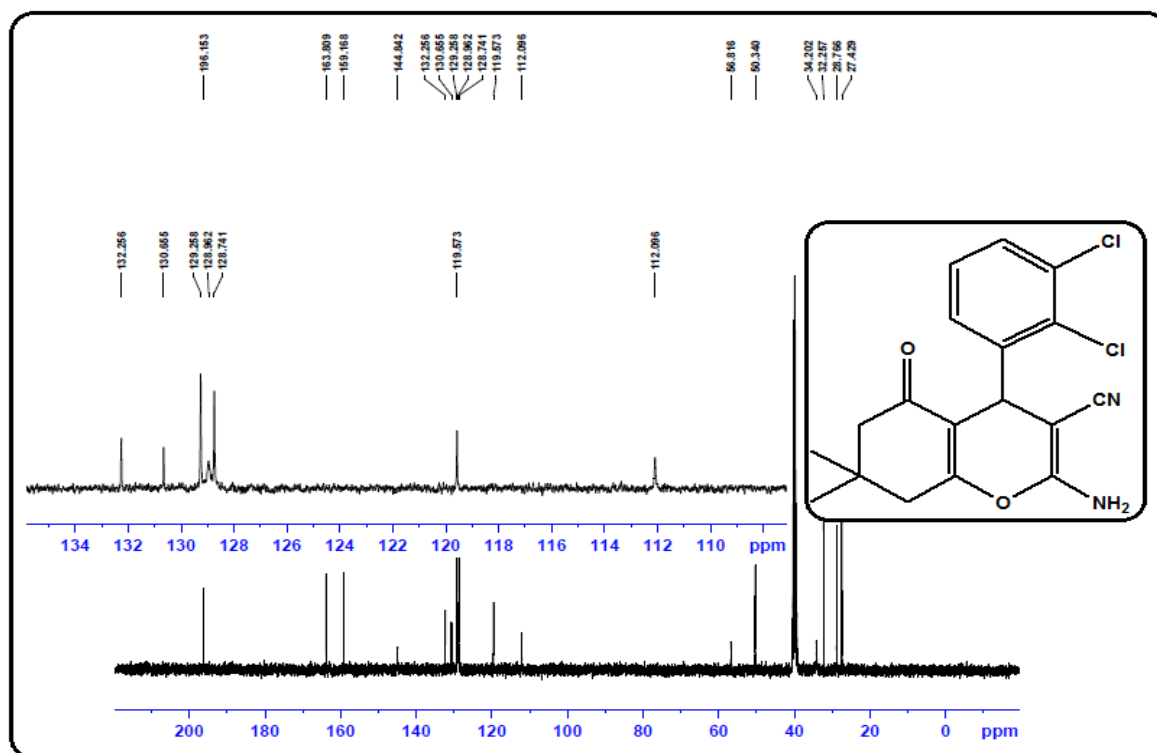
2-amino-7,7-dimethyl-4-(naphthalen-1-yl)-5-oxo-5,6,7,8-tetrahydro-4H-chromene-3-carbonitrile



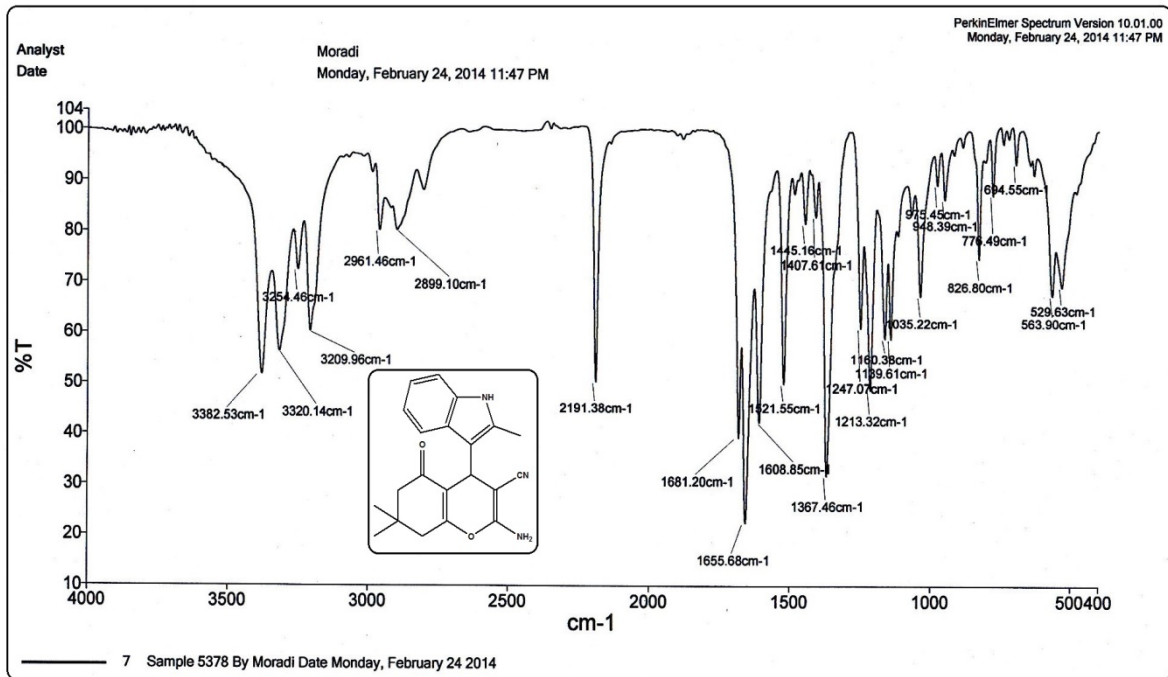


2-amino-4-(2,3-dichlorophenyl)-7,7-dimethyl-5-oxo-5,6,7,8-tetrahydro-4H-chromene-3-carbonitrile

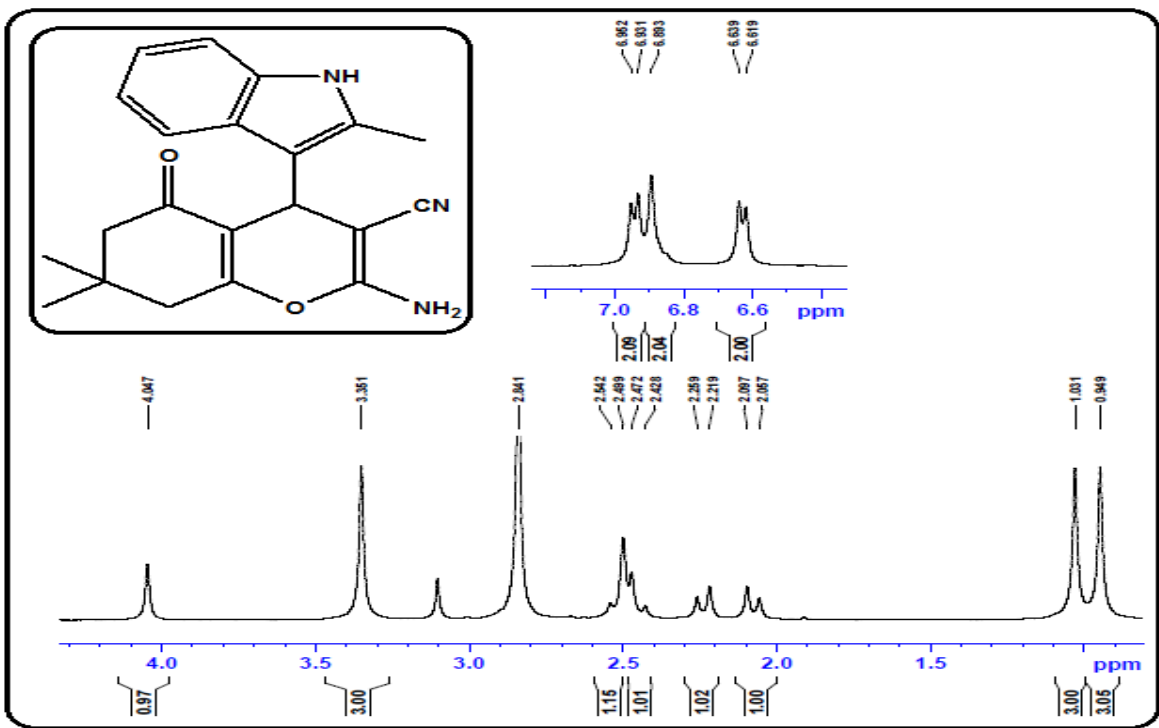




2-amino-7,7-dimethyl-4-(2-methyl-1H-indol-3-yl)-5-oxo-5,6,7,8-tetrahydro-4H-chromene-3-carbonitrile







**(E)-2-amino-7,7-dimethyl-5-oxo-4-styryl-5,6,7,8-tetrahydro-4H-chromene-3-carbonitrile**

