

Supporting information

Fabrication and characterization of nickel ferrite encapsulated silica particles bearing triazine as an effective reusable solid base nanocatalyst for synthesis of 4*H*-chromenes under mild conditions

Maryam Mohammadi, Hossein Naeimi*, Zohreh Zahraei

Synthesis of 4*H*-chromene derivatives catalyzed by tris (NiFe₂O₄@SiO₂PrThioTriazole) TriAzine

In one pot, 5, 5-dimethyl-1,3-cyclohexanedione (1 mmol), an aromatic aldehyde (1 mmol), malononitrile (1 mmol), and the nanocatalyst (0.04 g) were mixed together and stirred in 2 mL of ethanol under reflux conditions. Thin-layer chromatography (TLC) was used to observe the progress of the reaction. After the reaction was completed, the mixture was filtered, and the resulting precipitate was washed with acetone for separation of the catalyst. The solvent of the sub-filter solution was then evaporated to obtain a pure product that was verified using melting point, FT-IR, and ¹H NMR analyses.

Spectral figures of compound 2-amino-4-(3-bromophenyl)-7,7- dimethyl-5-oxo-5,6,7,8-tetrahydro-4H- chromene-3-carbonitrile (4a);	3
Spectral figures of compound 2-amino-4-(3-nitrophenyl)-7,7- dimethyl-5-oxo-5,6,7,8-tetrahydro-4H- chromene-3-carbonitrile (4b);	4
Spectral figures of compound 2-amino-4-(4-chlorophenyl)-7,7- dimethyl-5-oxo-5,6,7,8-tetrahydro-4H- chromene-3-carbonitrile (4c);	5
Spectral figures of compound 2-amino-4-(4-dimethylaminophenyl)-7,7- dimethyl-5-oxo-5,6,7,8-tetrahydro-4H- chromene-3-carbonitrile (4d);	6
Spectral figures of compound 2-amino-4-(2-chlorophenyl)-7,7- dimethyl-5-oxo-5,6,7,8-tetrahydro-4H- chromene-3-carbonitrile (4e);	7
Spectral figures of compound 2-amino-4-(2-nitrophenyl)-7,7- dimethyl-5-oxo-5,6,7,8-tetrahydro-4H- chromene-3-carbonitrile (4f);	8
Spectral figures of compound 2-amino-4-(4-nitrophenyl)-7,7- dimethyl-5-oxo-5,6,7,8-tetrahydro-4H- chromene-3-carbonitrile (4g);	9
Spectral figures of compound 2-amino-4-(3-methoxyphenyl)-7,7- dimethyl-5-oxo-5,6,7,8-tetrahydro-4H- chromene-3-carbonitrile (4h);	10
Spectral figures of compound 2-amino-4-(3-cyanophenyl)-7,7- dimethyl-5-oxo-5,6,7,8-tetrahydro-4H- chromene-3-carbonitrile (4i);	11
Spectral figures of compound 2-amino-4-(2,6-dichlorophenyl)-7,7- dimethyl-5-oxo-5,6,7,8-tetrahydro-4H- chromene-3-carbonitrile (4j);	12
Spectral figures of compound 2-amino-4-(phenyl)-7,7- dimethyl-5-oxo-5,6,7,8-tetrahydro-4H- chromene-3- carbonitrile (4k);	13
Spectral figures of compound 2-amino-4-(H)-7,7- dimethyl-5-oxo-5,6,7,8-tetrahydro-4H- chromene-3-carbonitrile (4l);	14

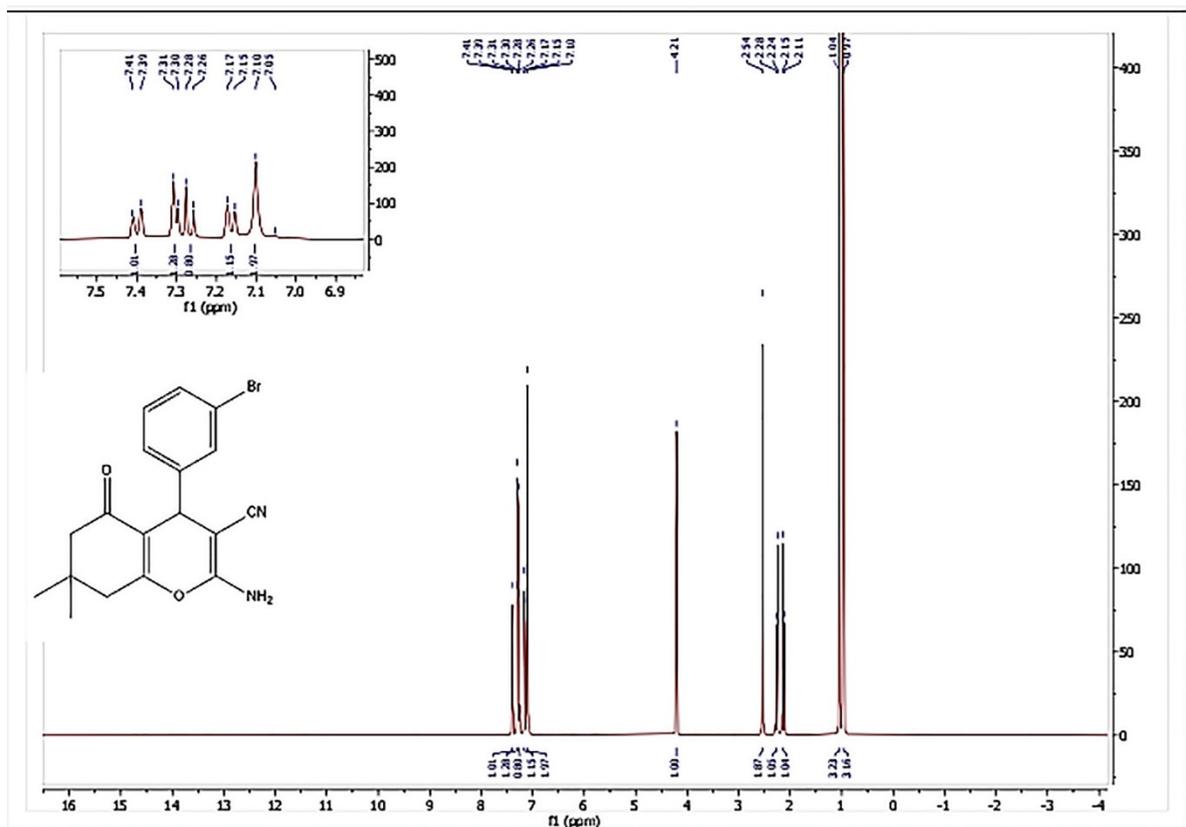


Figure S1. ¹H NMR 4a

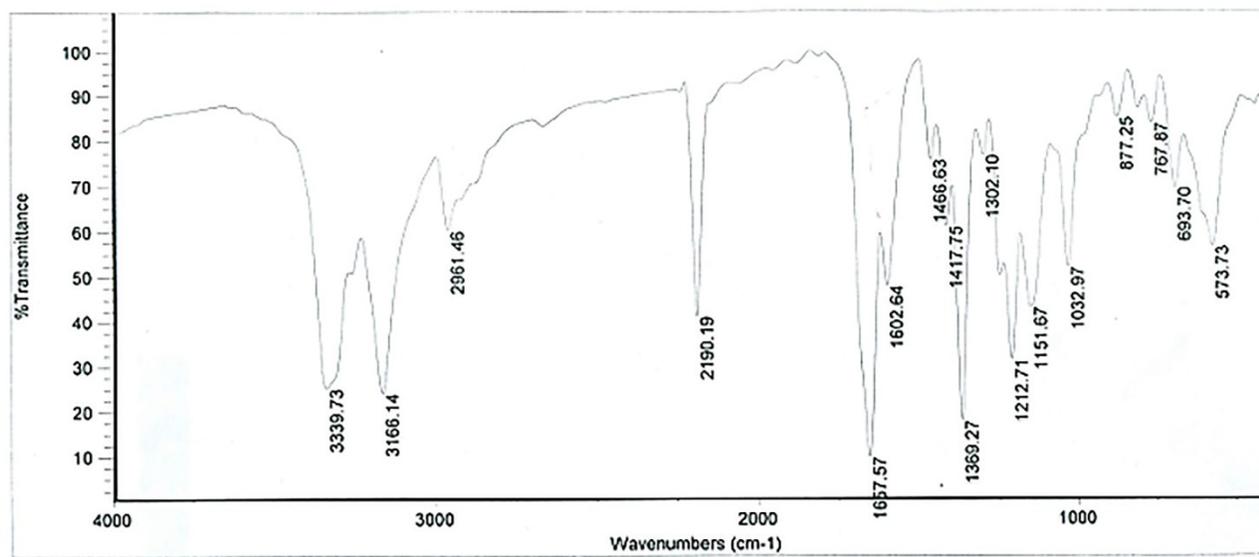


Figure S2. FT-IR 4a

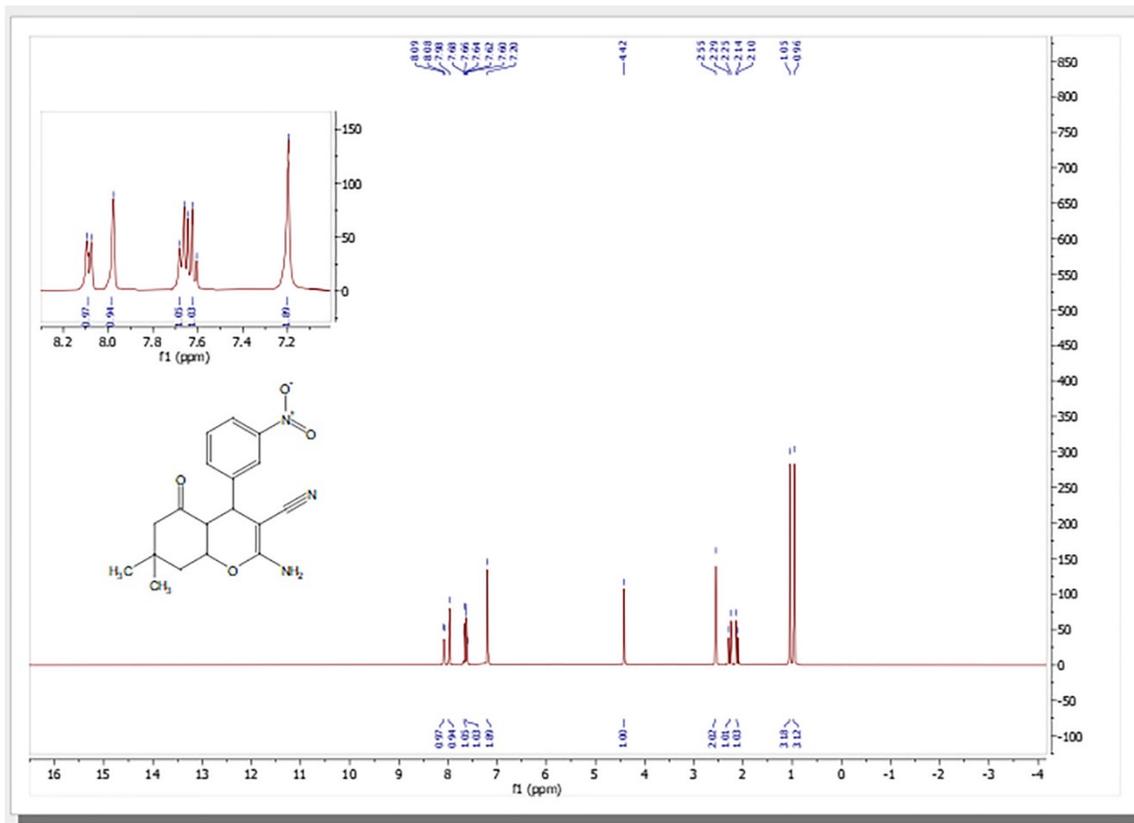


Figure S3. ¹H NMR 4b

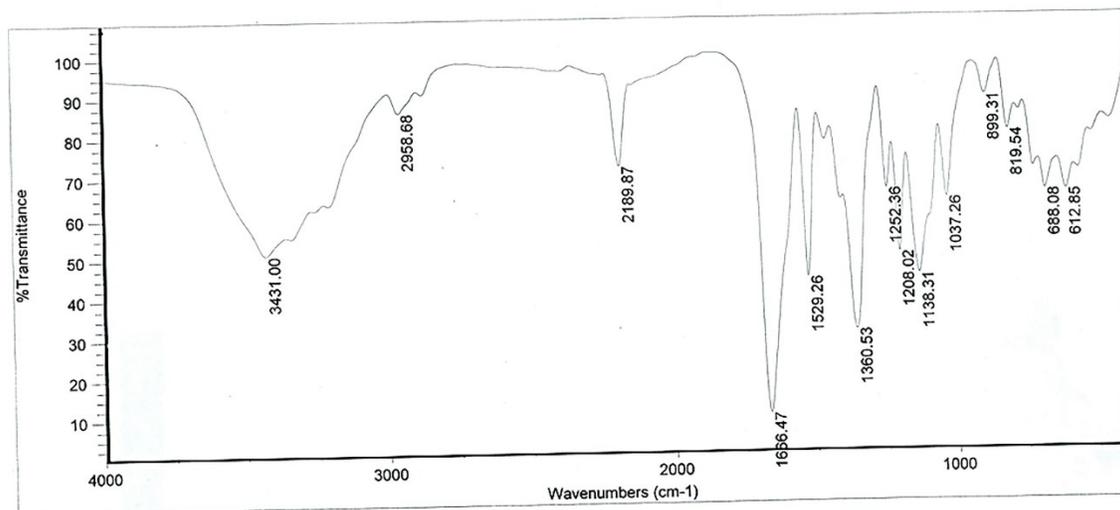


Figure S4. FR-IR 4b

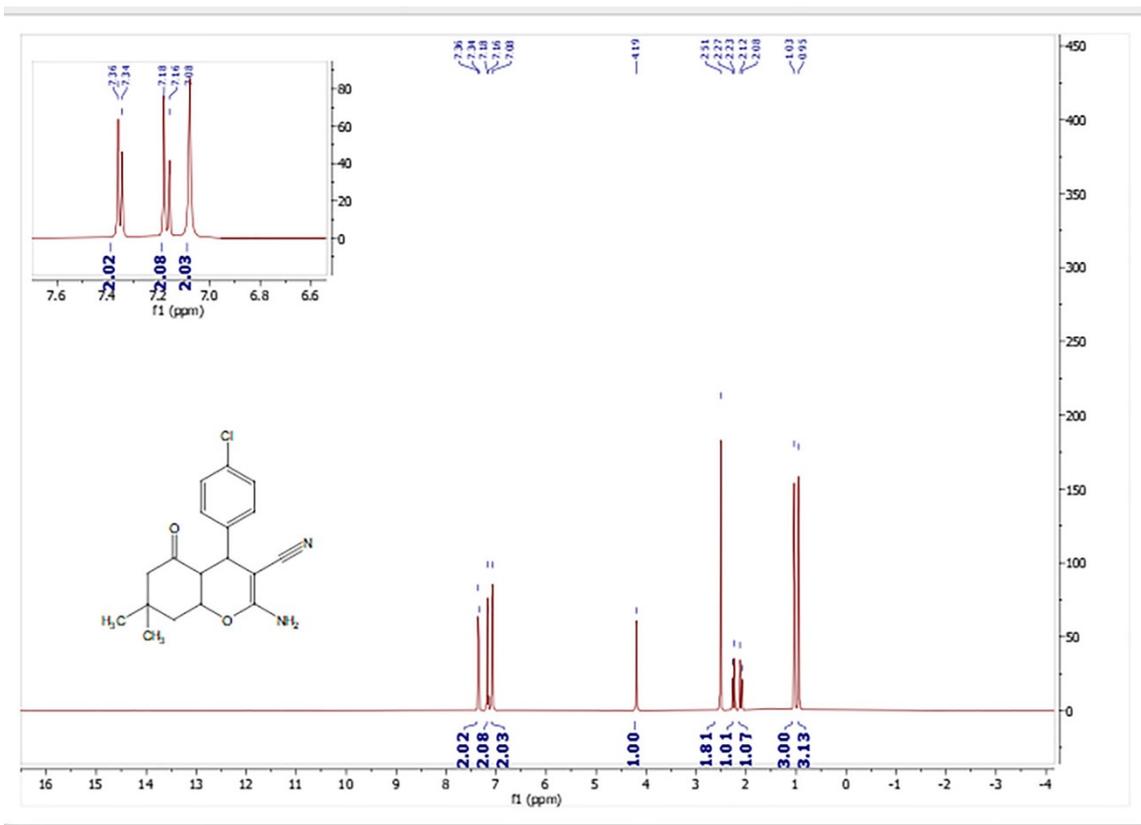


Figure S5. ¹H NMR 4c

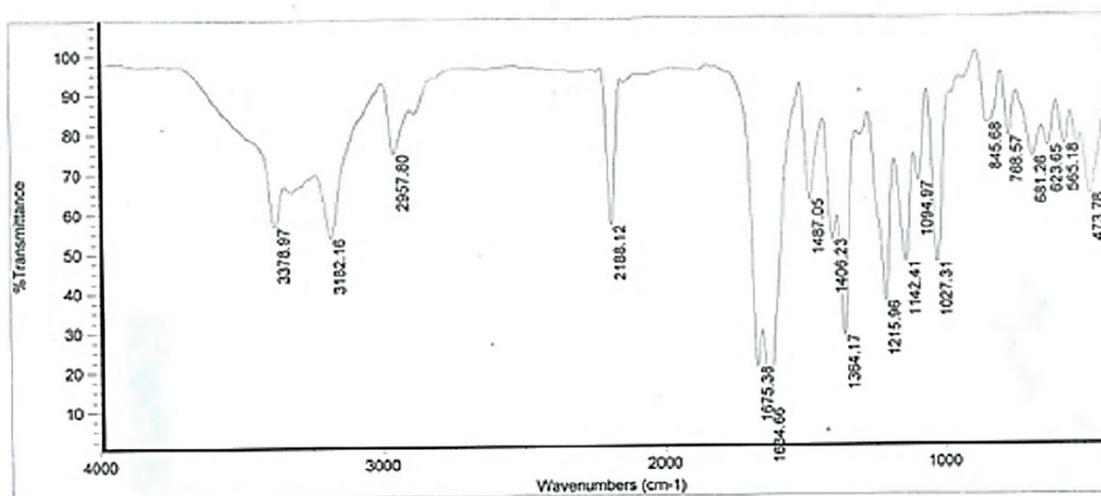


Figure S6. FT-IR 4c

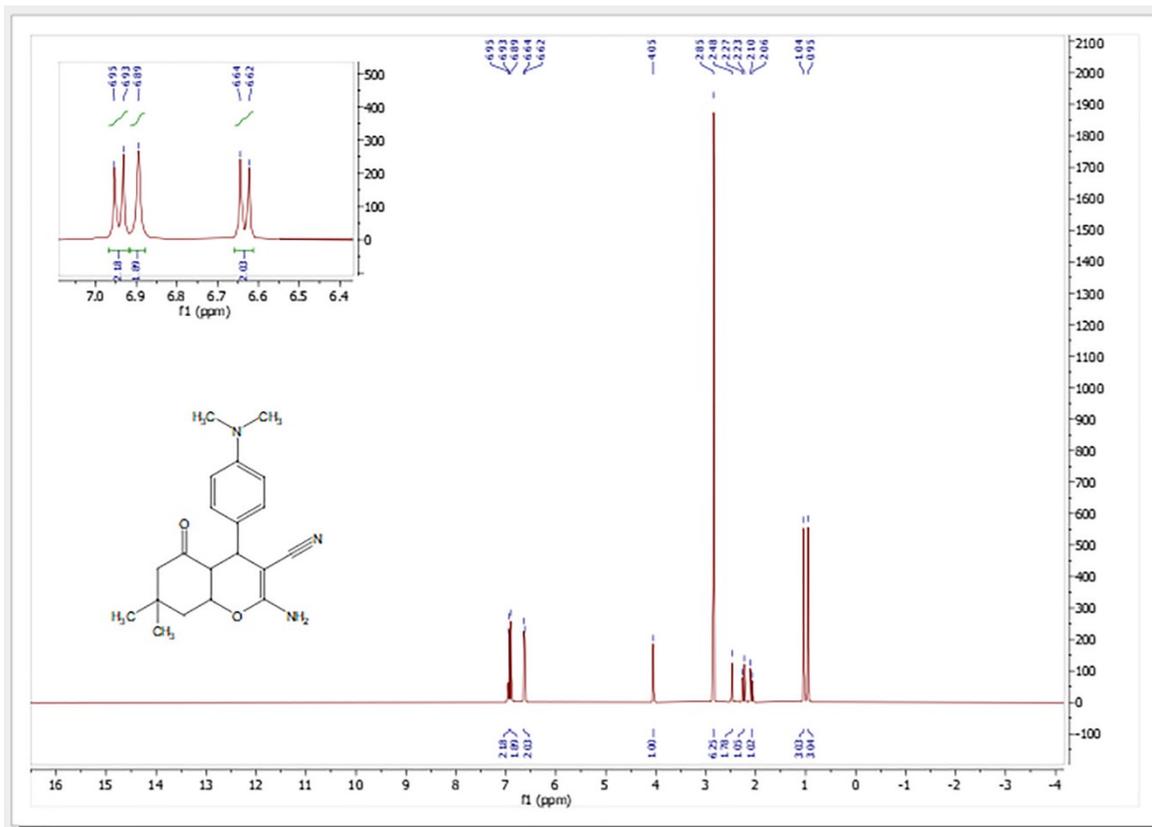


Figure S7. ¹H NMR 4d

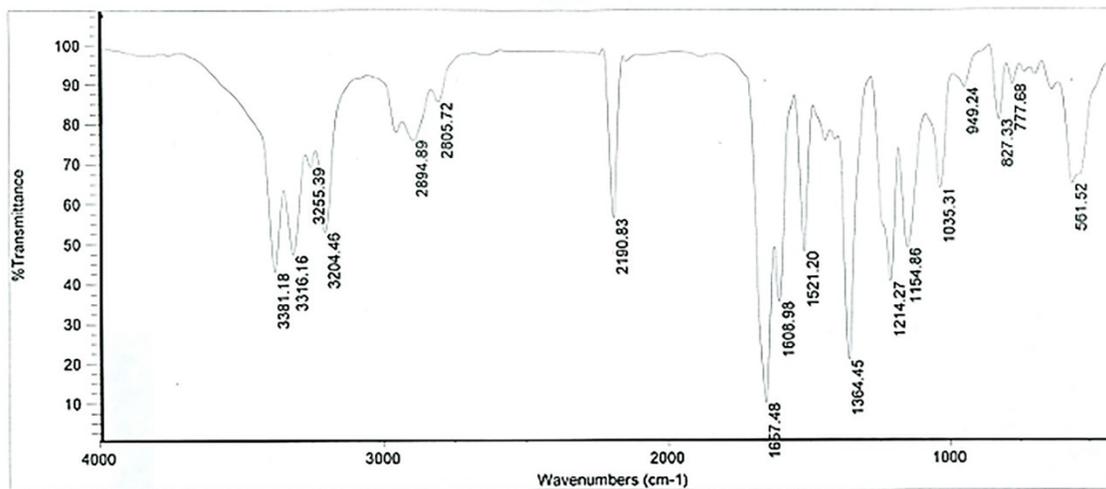


Figure S8. FT- IR 4d

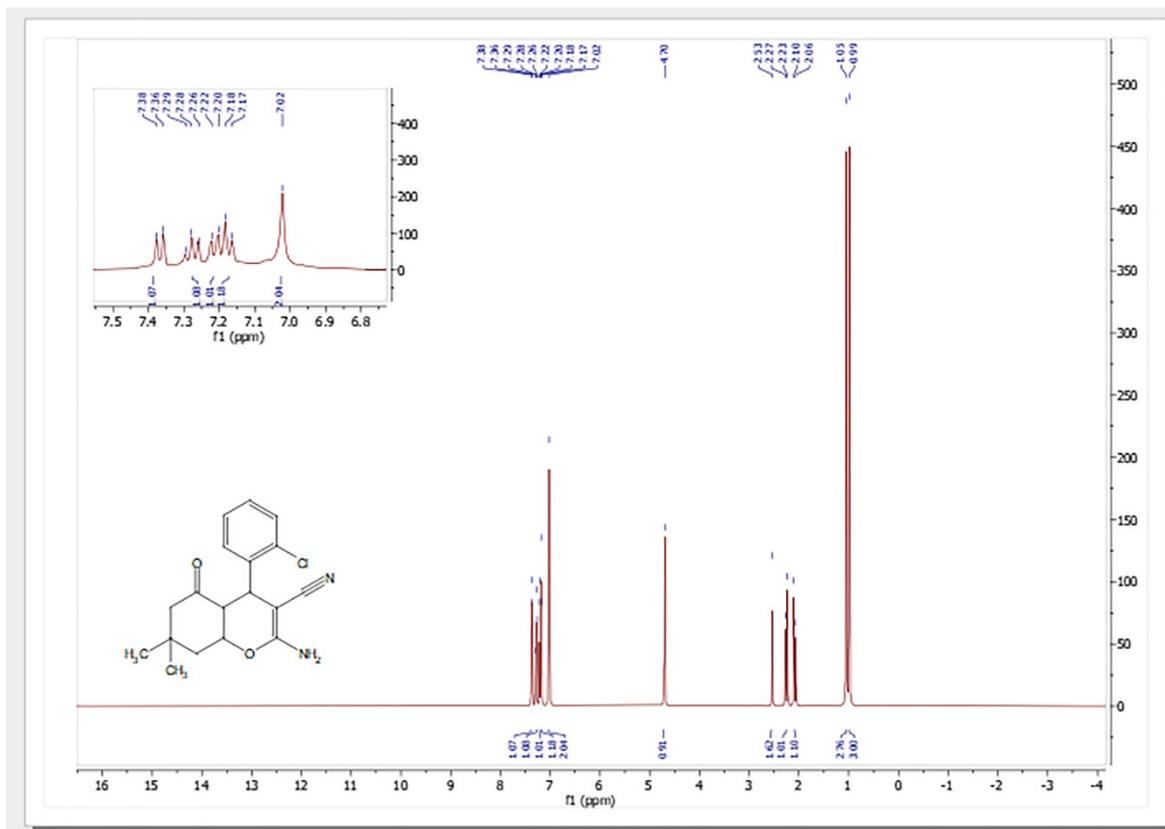


Figure S9. ¹H NMR 4e

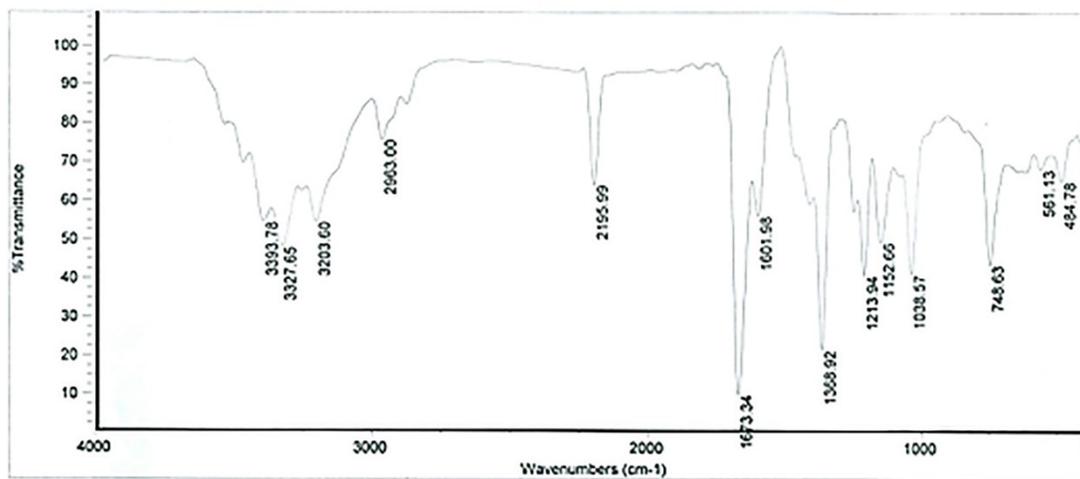


Figure S10. FT-IR 4e

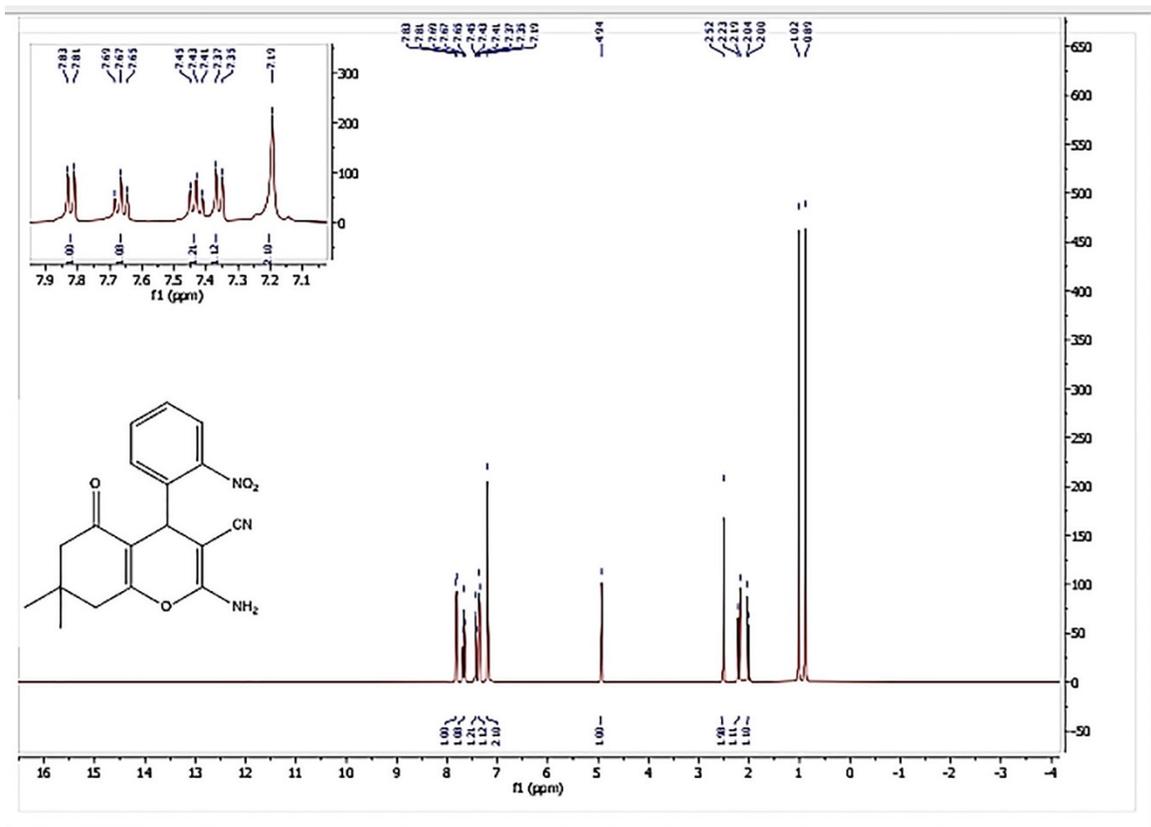


Figure S11. ¹H NMR 4f

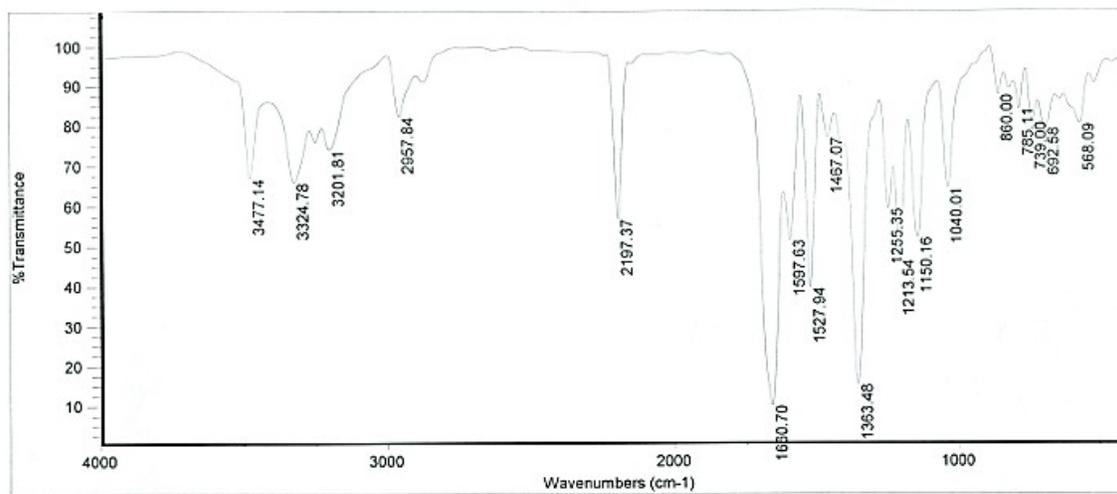


Figure S12. FT-IR 4f

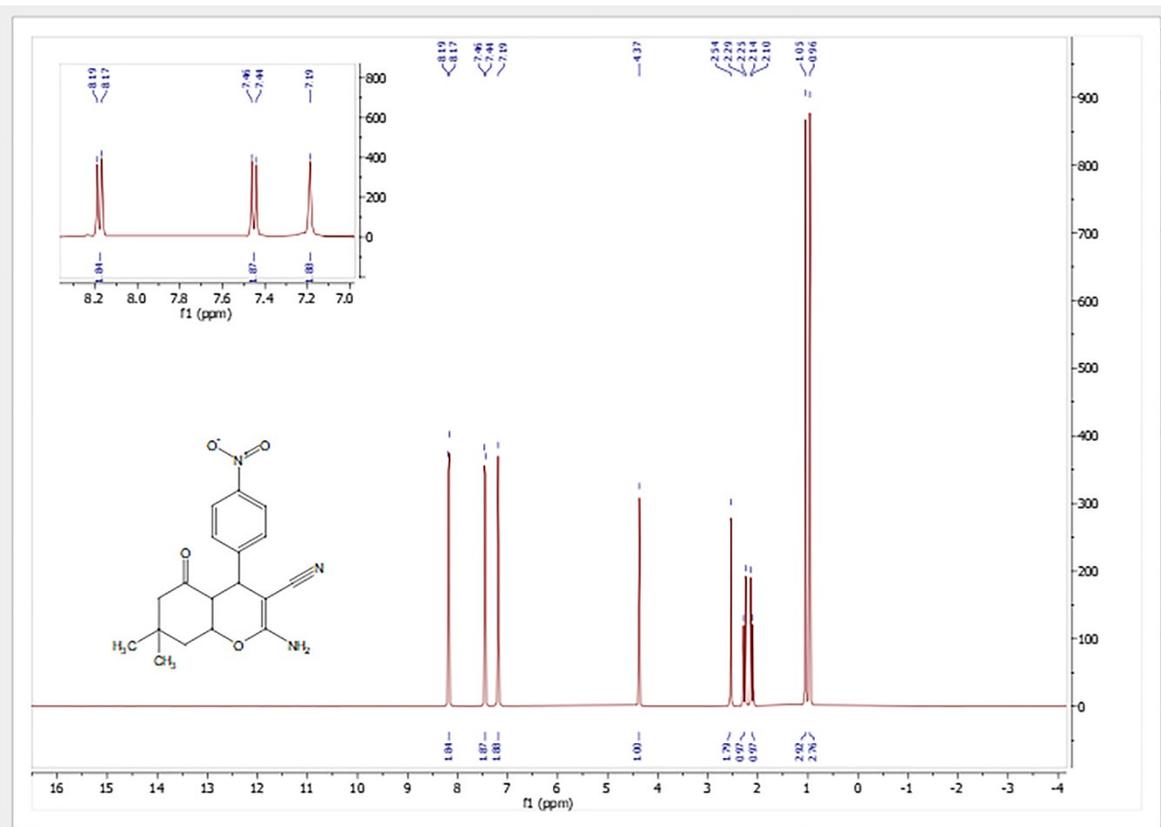


Figure S13. ¹H NMR 4g

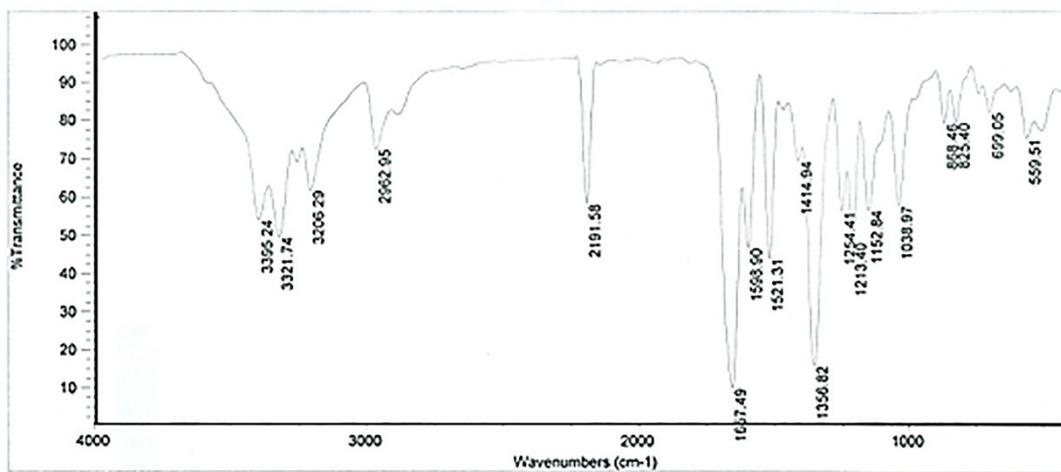


Figure S14. FT-IR 4g

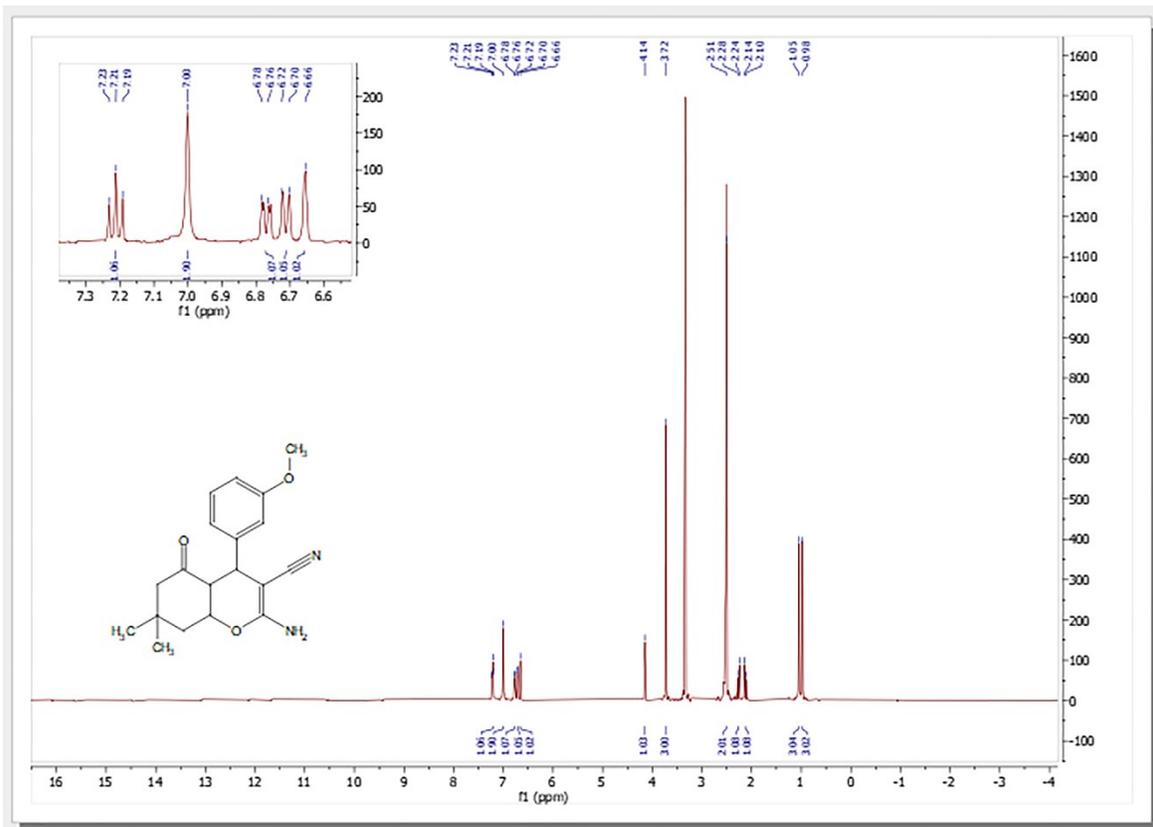


Figure S15. ¹H NMR 4h

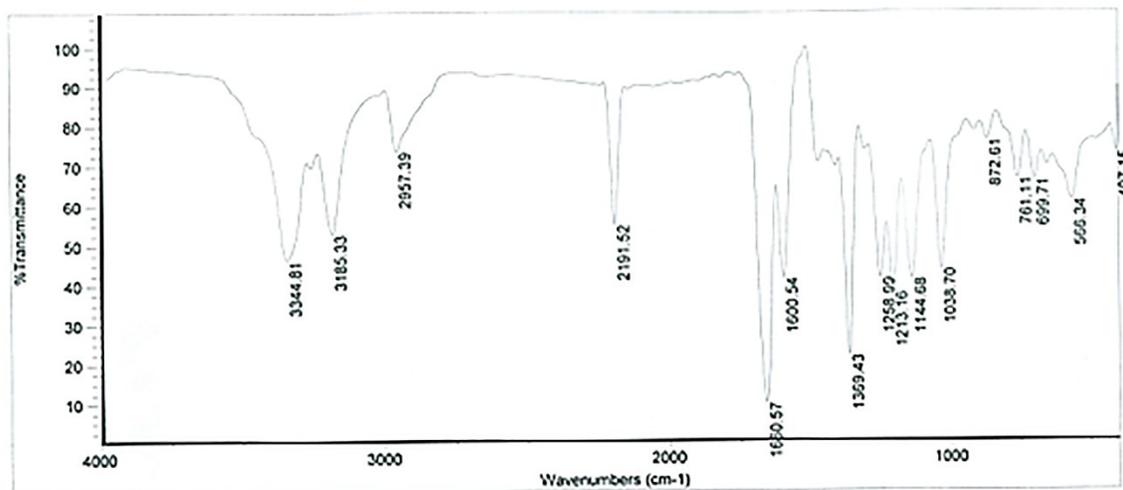


Figure S16. FT-IR 4h

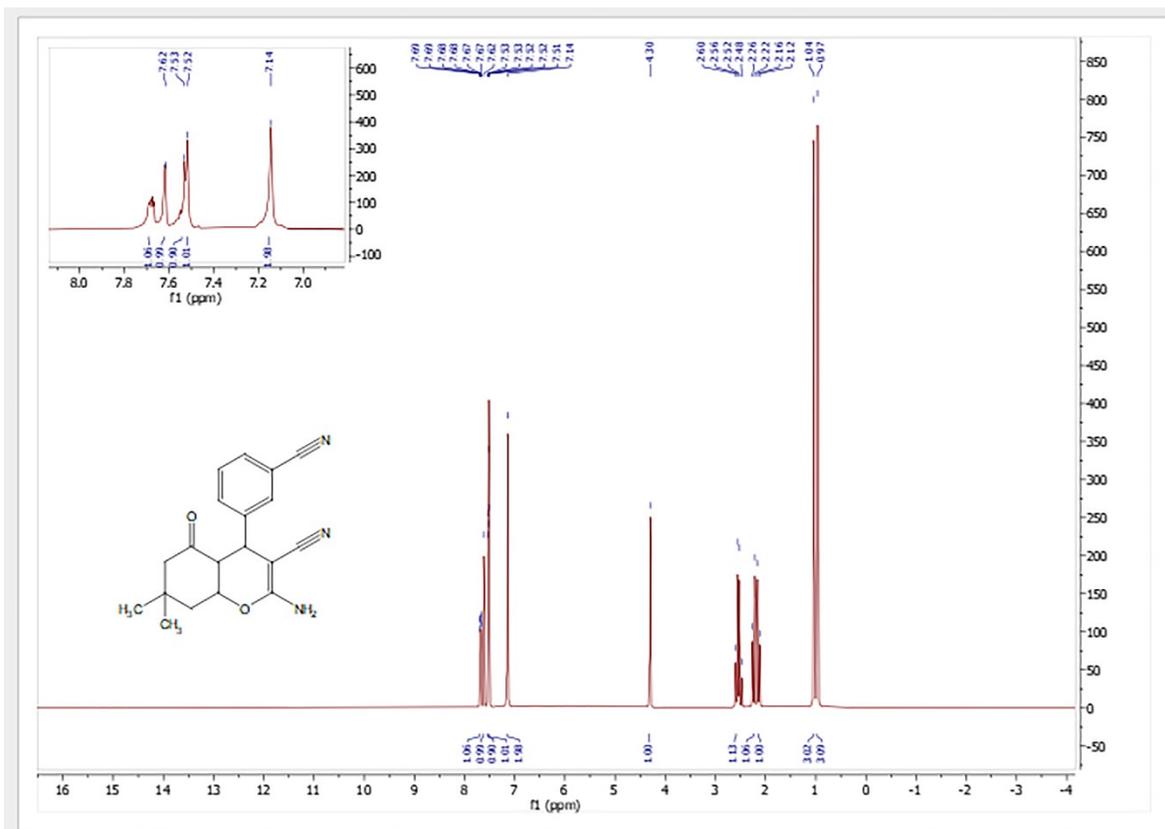


Figure S17. ¹H NMR 4i

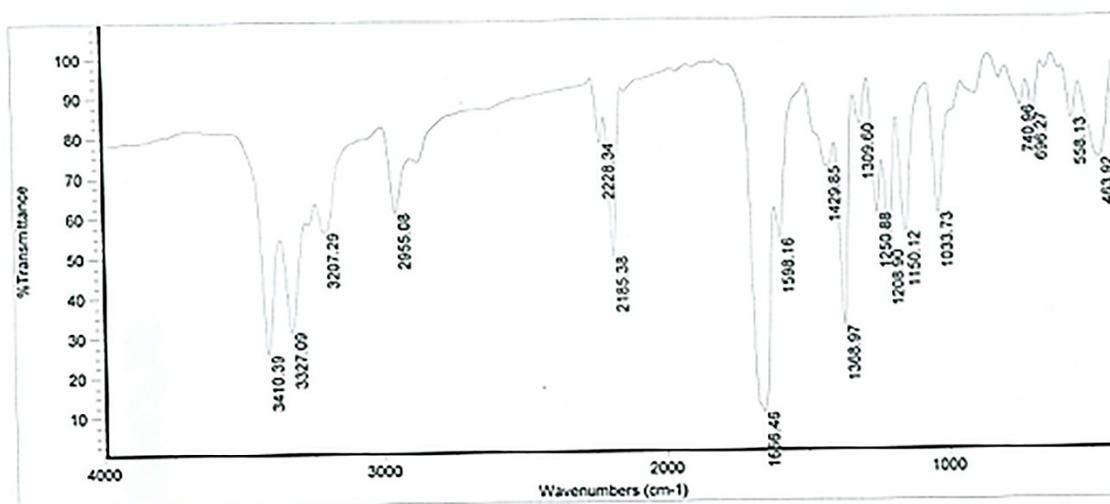


Figure S18. FT-IR 4i

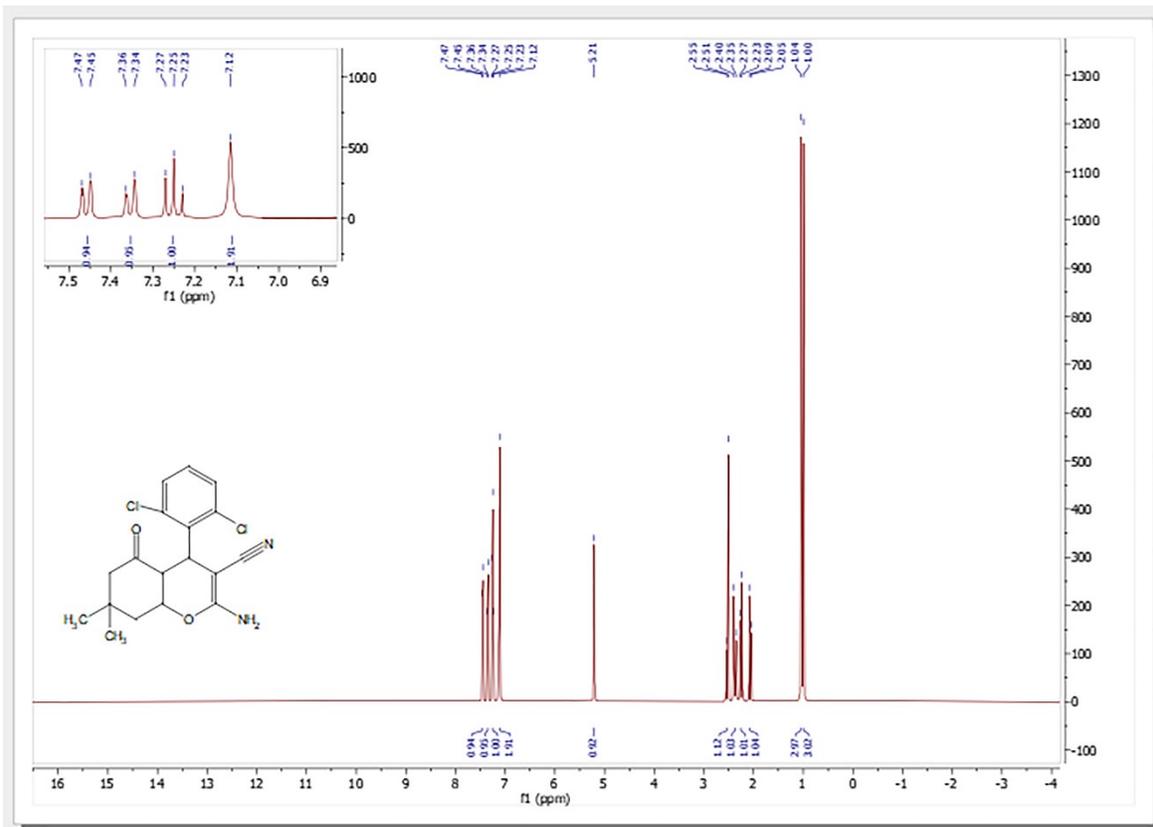


Figure S19. ¹H NMR 4j

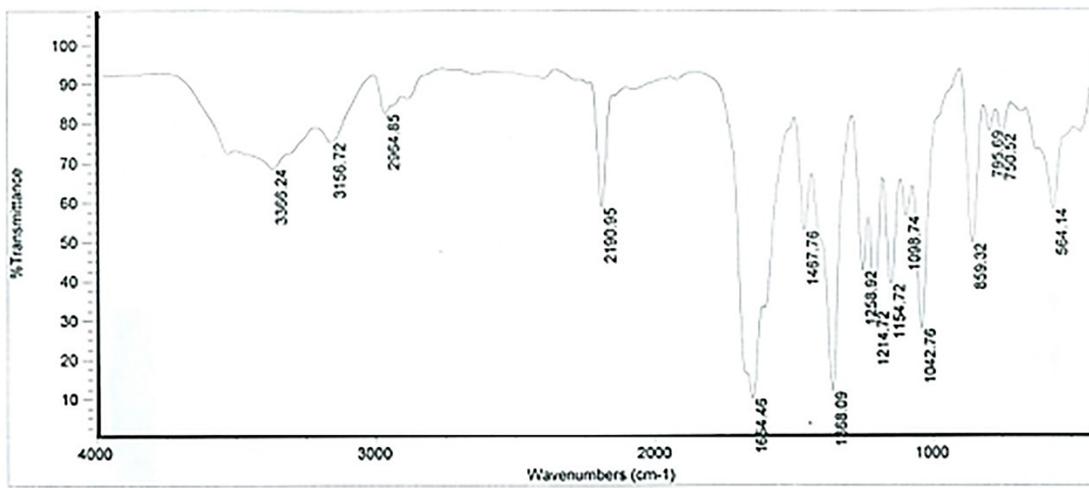


Figure S20. FT- IR 4j

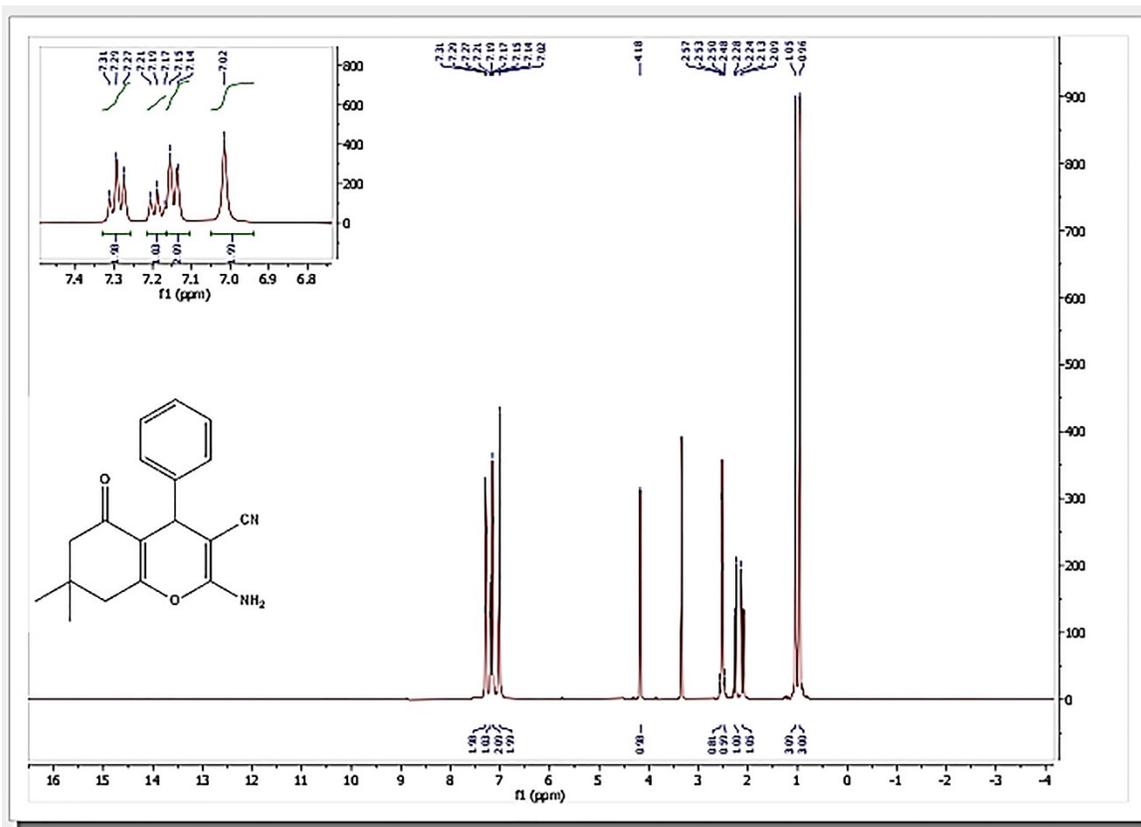


Figure S21. ¹H NMR 4k

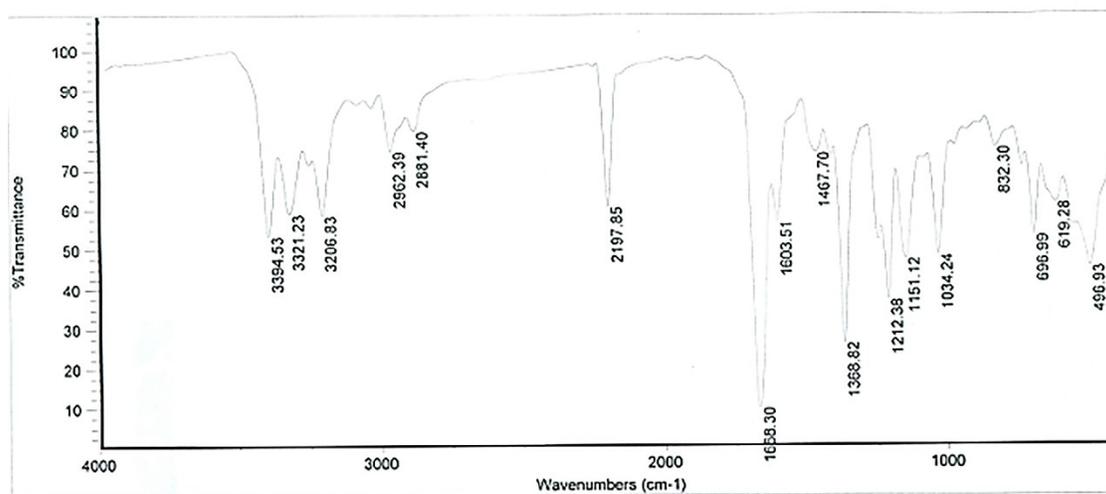


Figure S22. FT-IR 4k

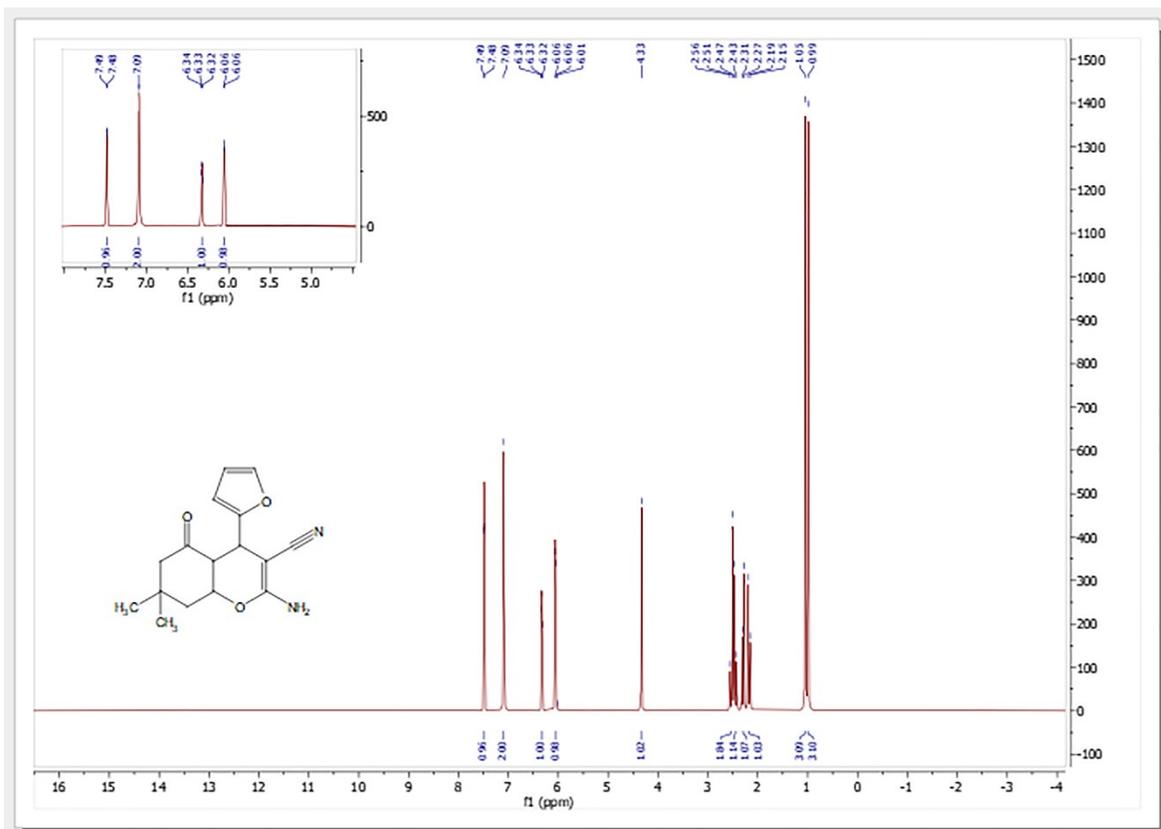


Figure S23. ^1H NMR 4l

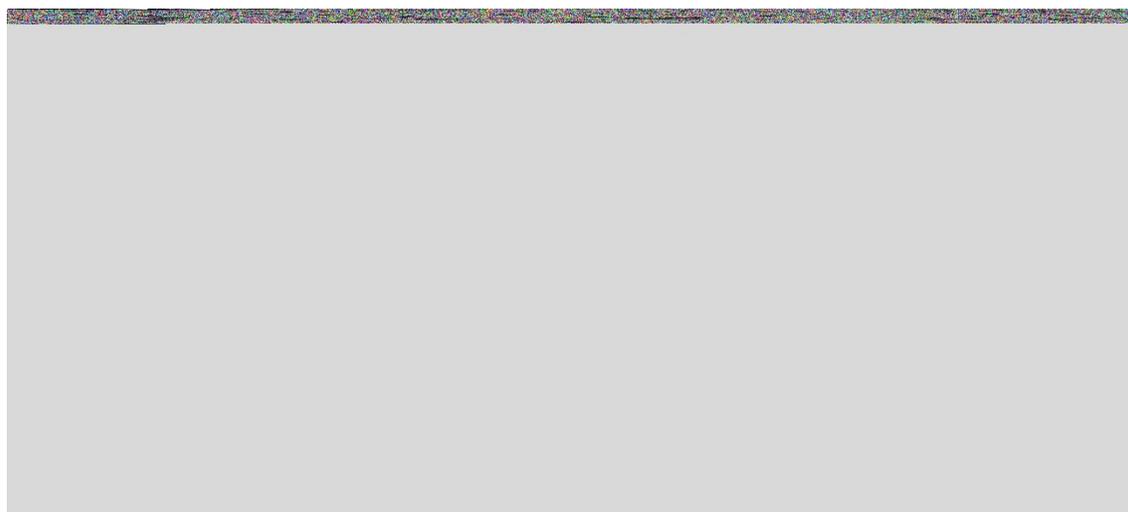


Figure S24. FT- IR 4l