

Supplementary Information

Fabricated Fe₃O₄ as an efficient catalyst for the synthesis of naphthapyranopyrimidines and 5-aryl-1, 2, 4-triazolidine-3-thione under microwave irradiation

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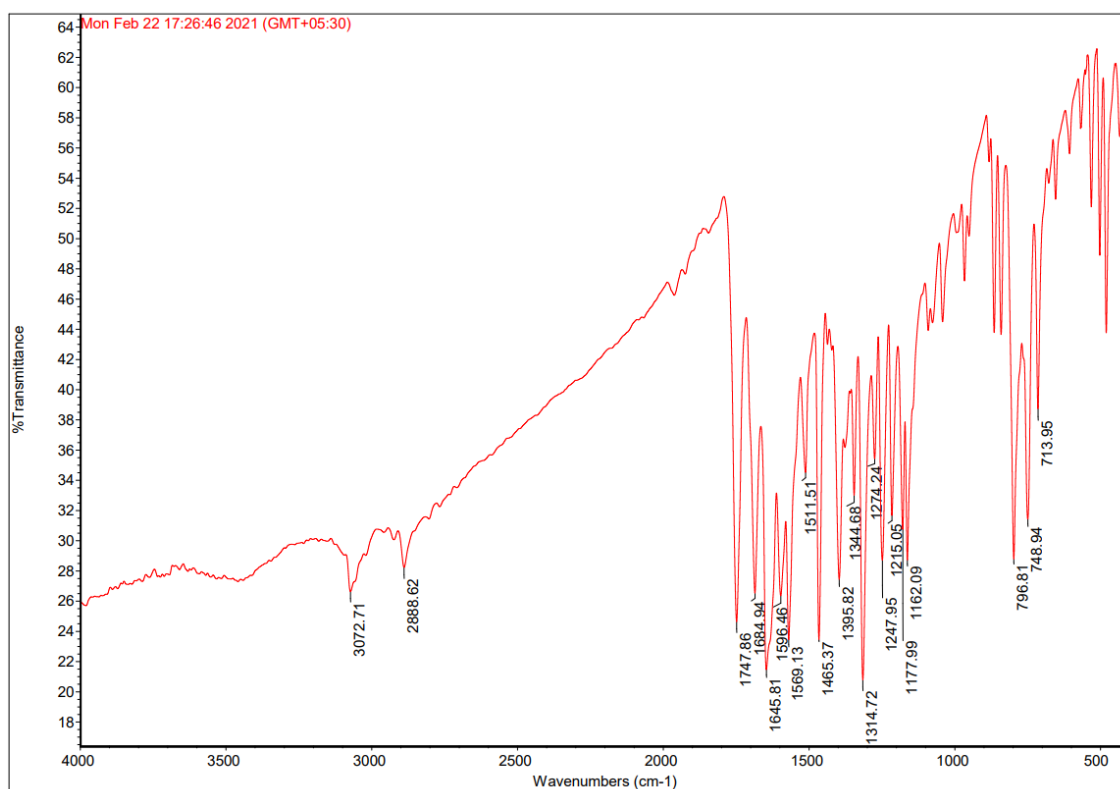


Fig. S1 — FT-IR spectrum of 12-phenyl-8,10-dimethyl-12H-naphtho[1',2':5,6] pyrano[2,3-d]pyrimidine-9,11-dione (**4a**)

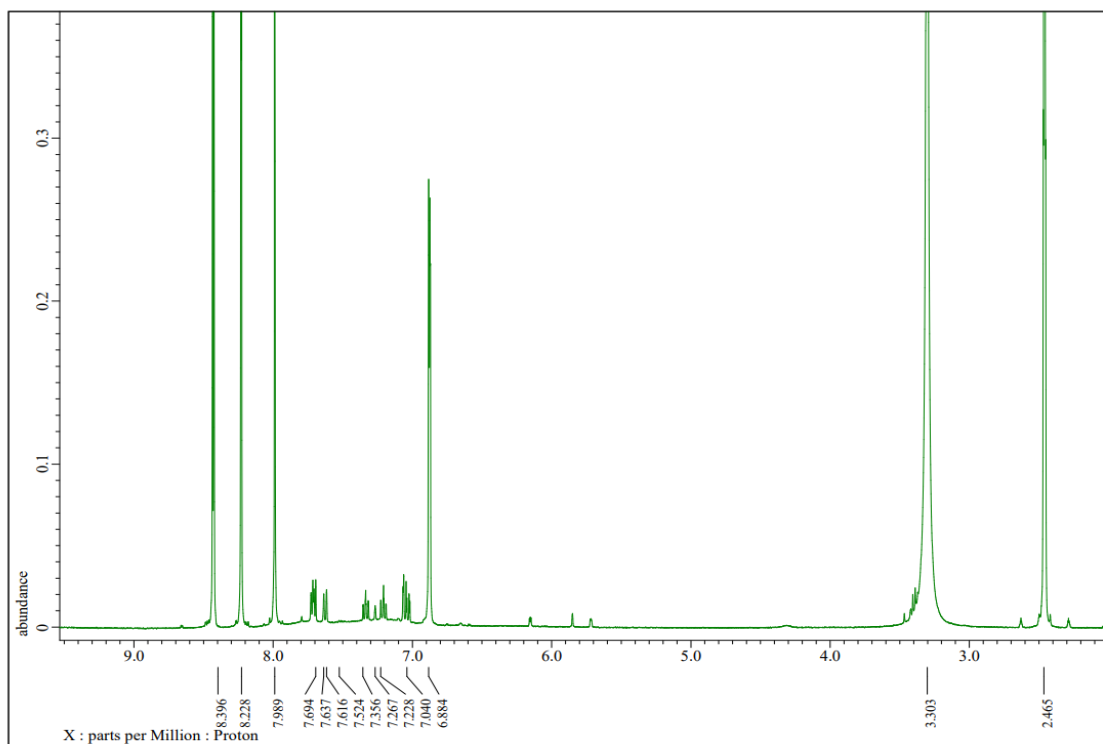


Fig. S2 — ¹H-NMR spectrum of 12-Phenyl-8,10-dimethyl-12H-naphtho[1',2':5,6] pyrano[2,3-d]pyrimidine-9,11-dione (**4a**)

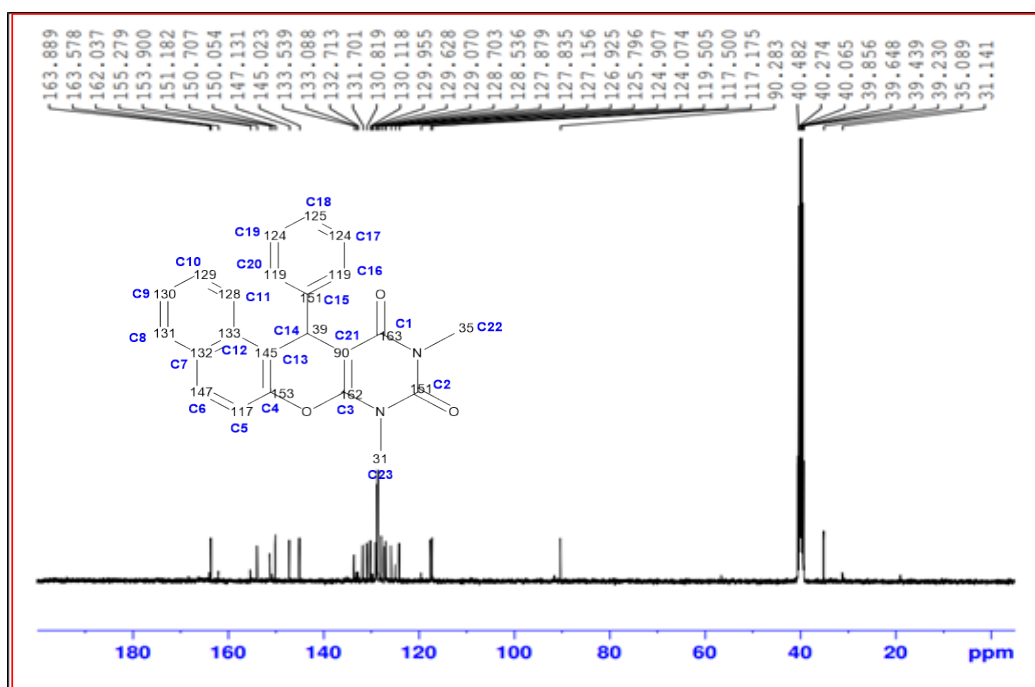


Fig. S3 — ^{13}C -NMR spectrum of 12-Phenyl-8,10-dimethyl-12*H*-naphtho[1',2':5,6] pyrano[2,3-*d*]pyrimidine-9,11-dione (**4a**)

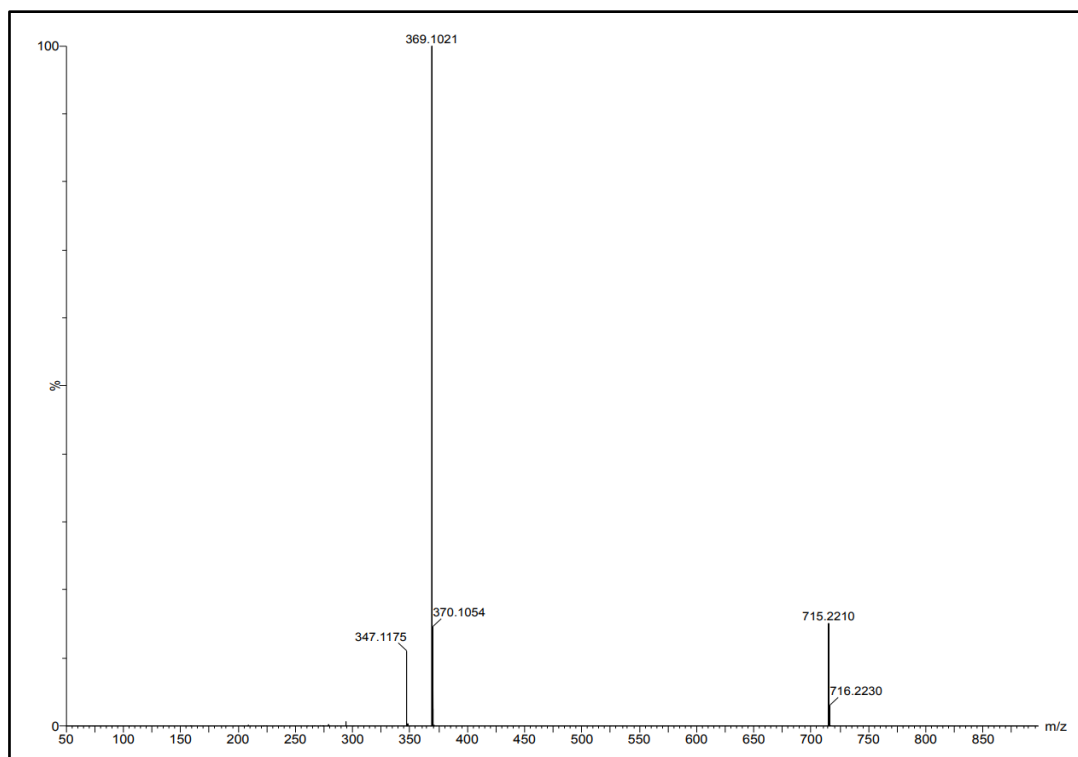


Fig. S4 — Mass spectrum of 12-Phenyl-8,10-dimethyl-12*H*-naphtho[1',2':5,6] pyrano[2,3-*d*]pyrimidine-9,11-dione (**4a**)

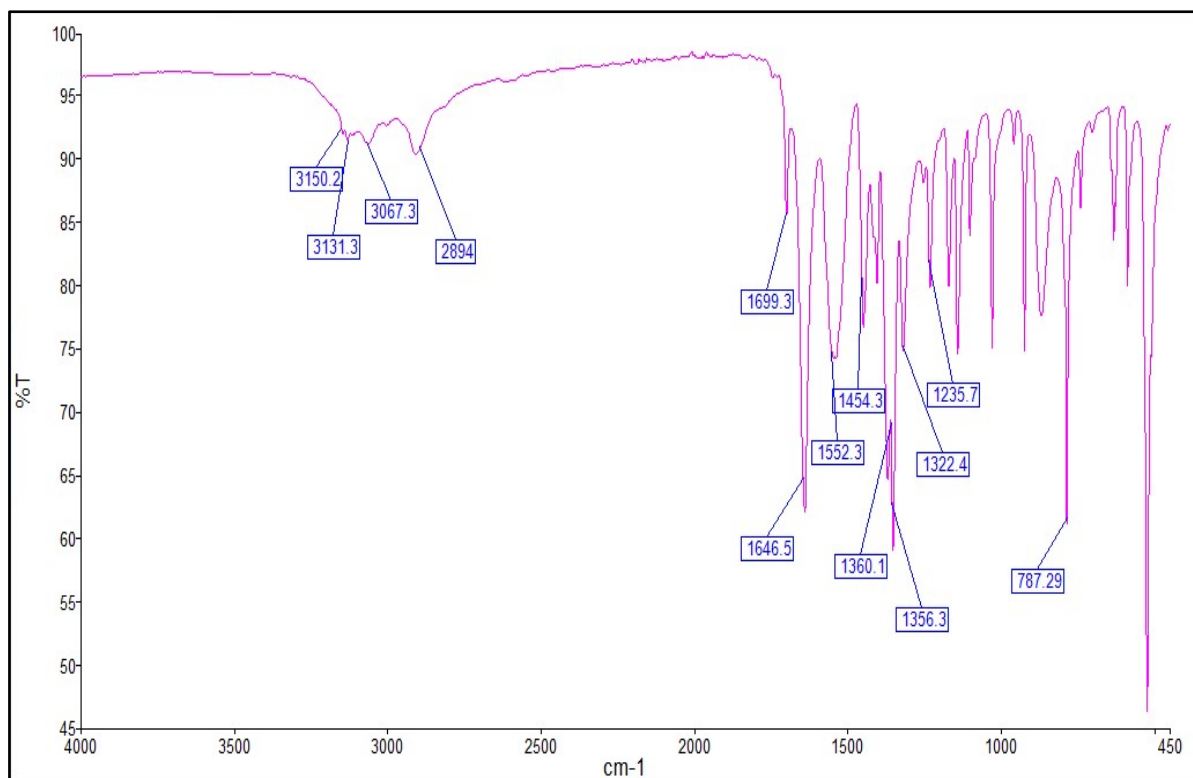


Fig. S5 — FT-IR spectrum of 12-(4-methylphenyl)-8,12-dihydro-8,10-dimethyl-9H-naphtho[1- ϵ ,2- ϵ :5,6]pyrano[2,3-d]pyrimidine-9,11-(10H)-dione (**4c**)

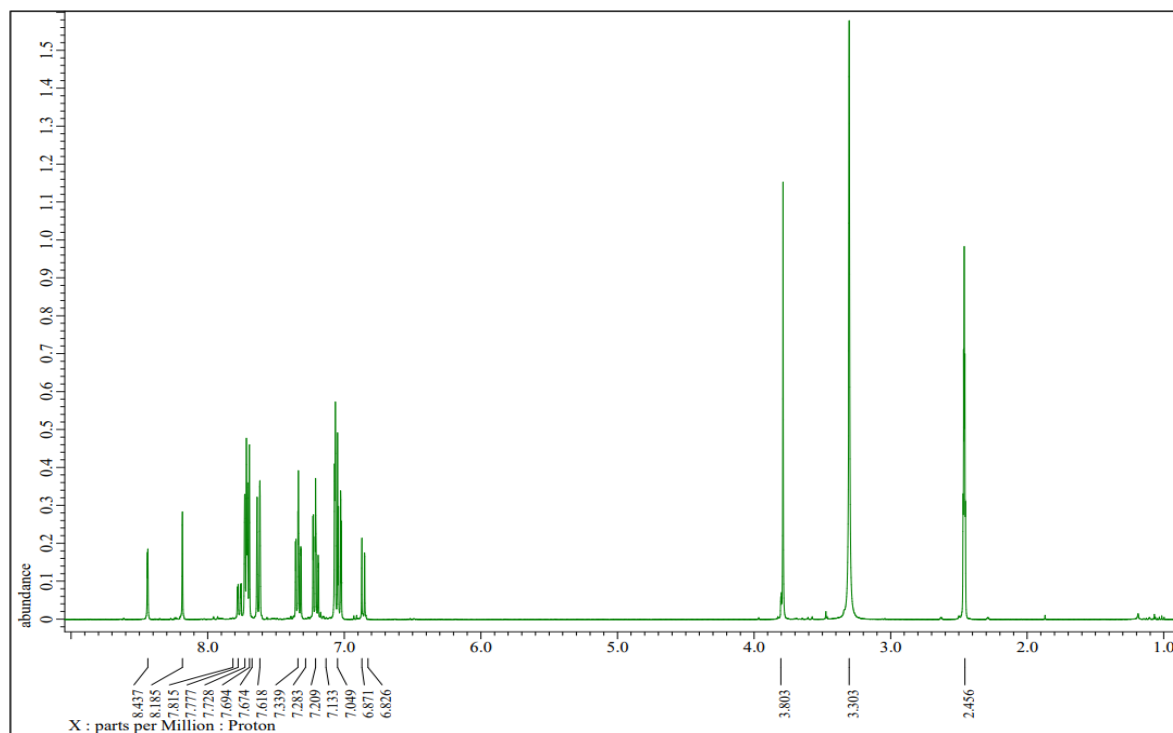


Fig. S6 — ¹H-NMR spectrum of 12-(4-methylphenyl)-8,12-dihydro-8,10-dimethyl-9H-naphtho[1- ϵ ,2- ϵ :5,6]pyrano[2,3-d]pyrimidine-9,11-(10H)-dione (**4c**)

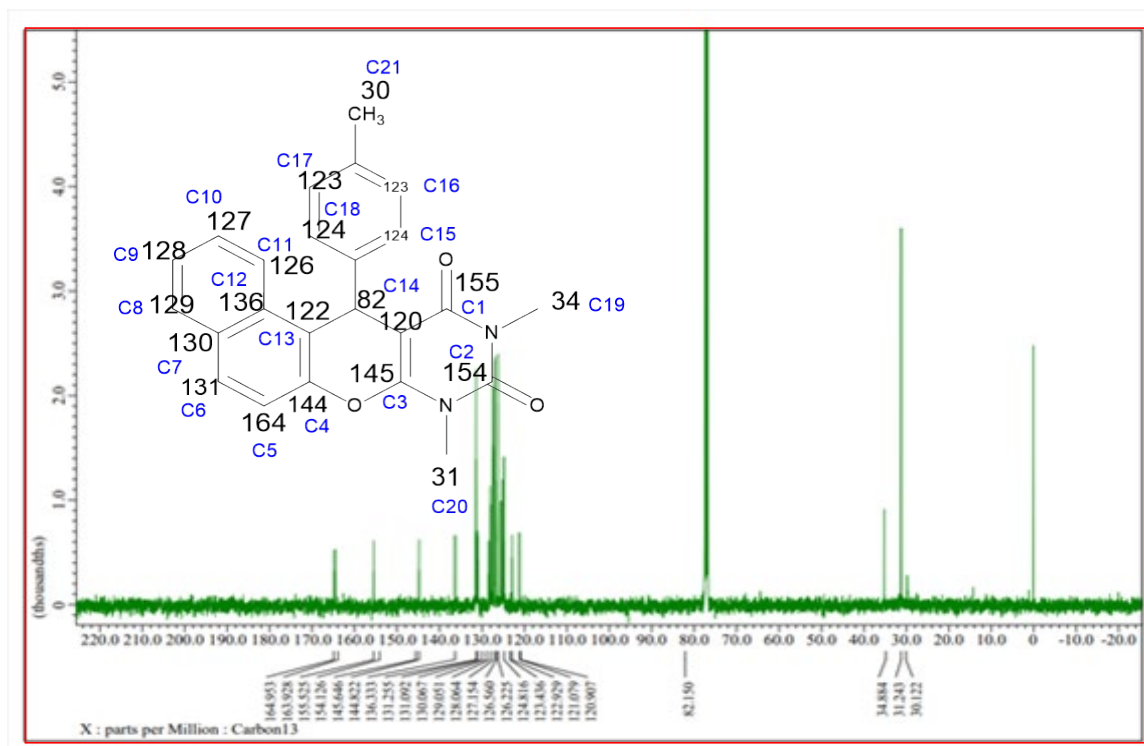


Fig. S7 — ^{13}C -NMR spectrum of 12-(4-methylphenyl)-8,12-dihydro-8,10-dimethyl-9H-naphtho[1- ϵ ,2- ϵ :5,6]pyrano[2,3-d]pyrimidine-9,11-(10H)-dione (**4c**)

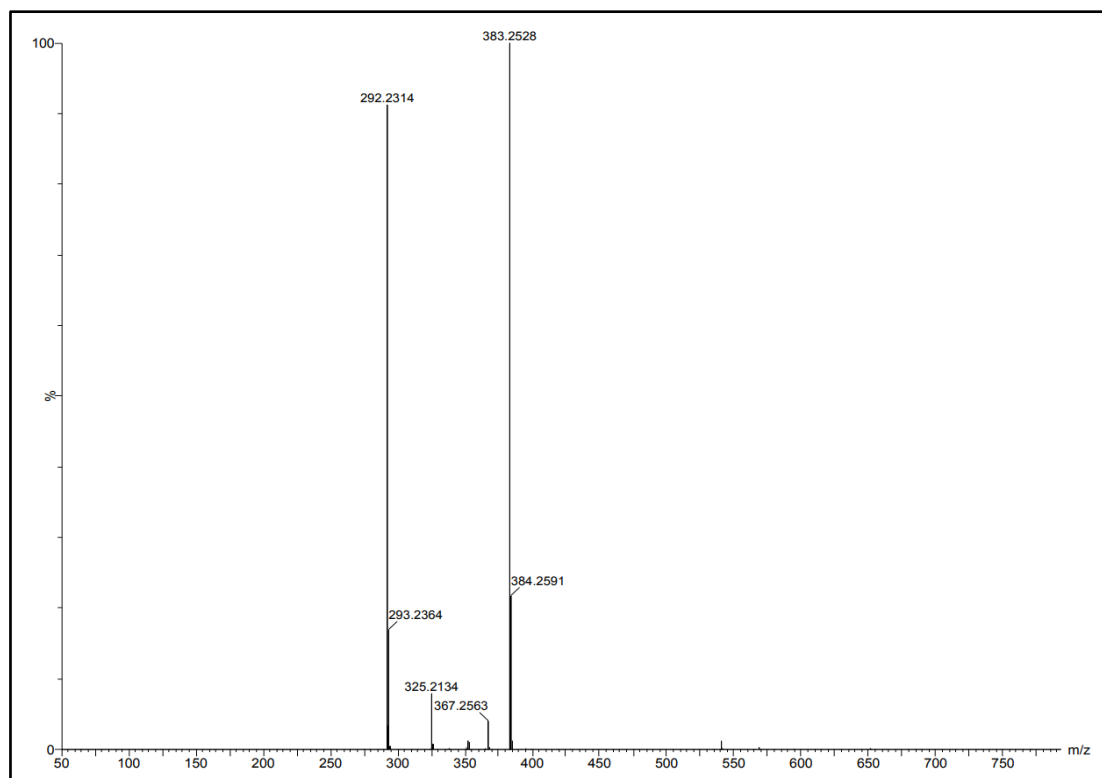


Fig. S8 — Mass spectrum of 12-(4-methylphenyl)-8,12-dihydro-8,10-dimethyl-9H-naphtho[1- ϵ ,2- ϵ :5,6]pyrano[2,3-d]pyrimidine-9,11-(10H)-dione (**4c**)

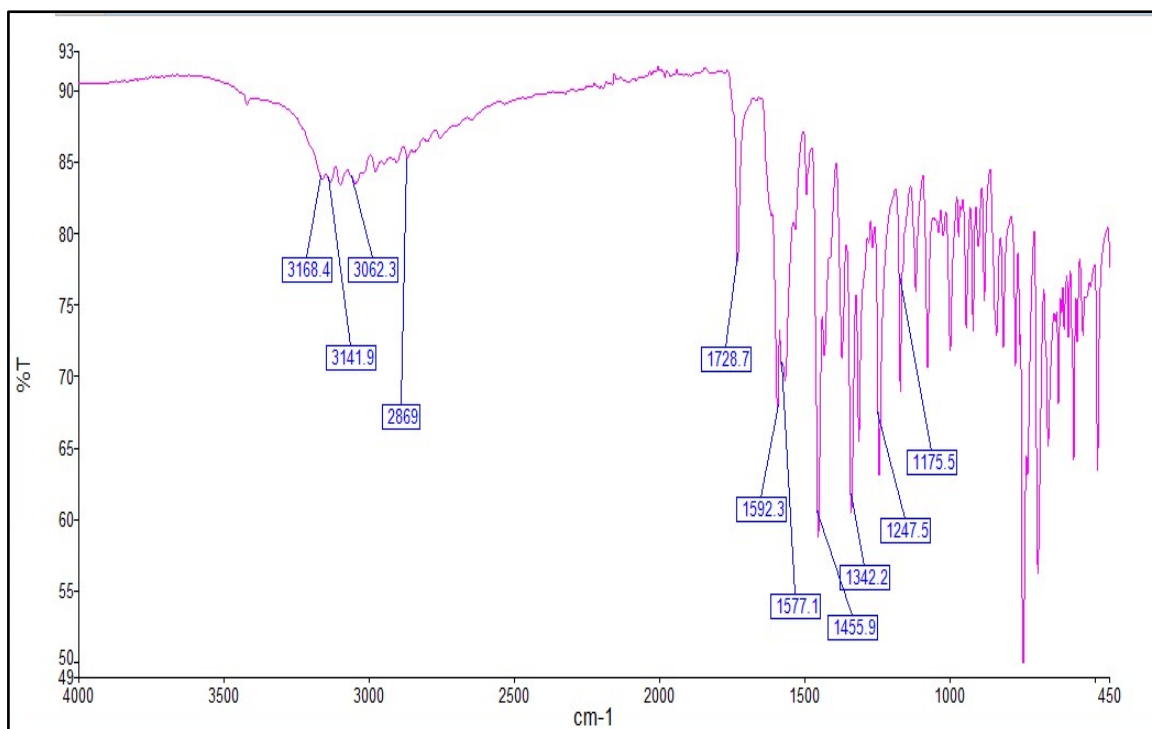


Fig. S9 — FT-IR spectrum of 12-(4-methoxyphenyl)-8,12-dihydro-8,10-dimethyl-9*H*-naphtho[1',2':5,6]pyrano[2,3-*d*]pyrimidine-9,11- (10*H*)-dione (**4d**)

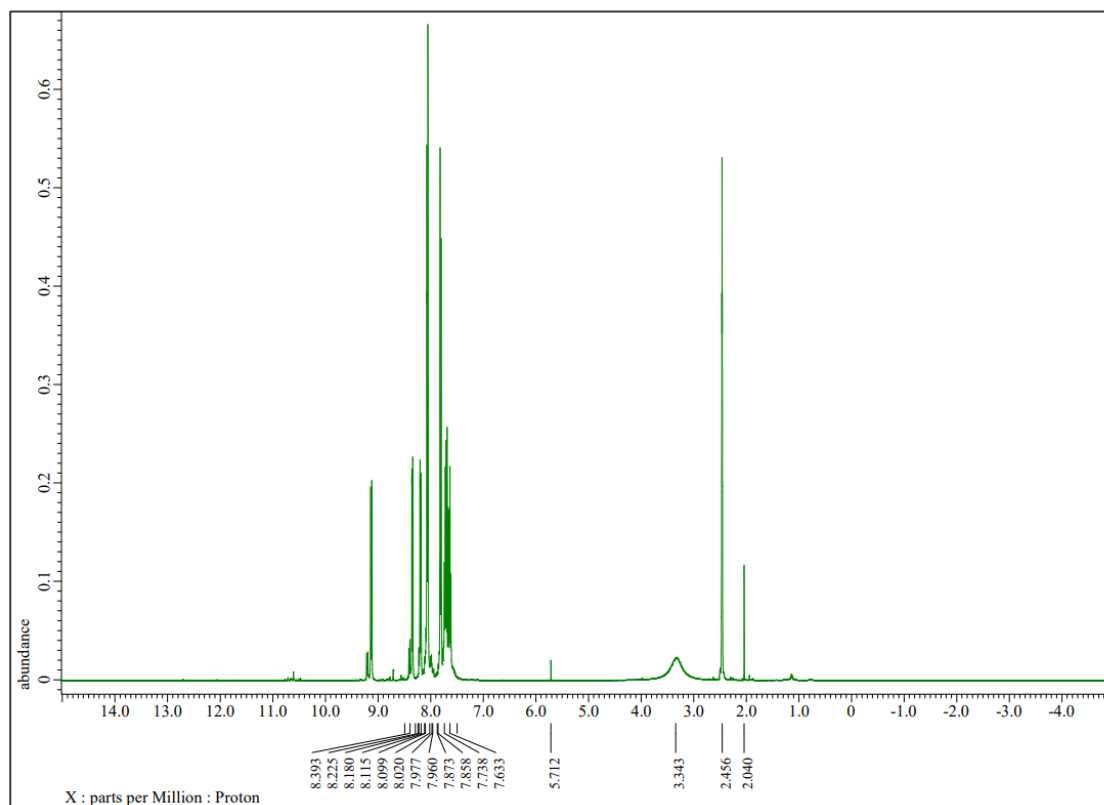


Fig. S10 — ¹H-NMR spectrum of 12-(4-methoxyphenyl)-8,12-dihydro-8,10-dimethyl-9*H*-naphtho[1',2':5,6]pyrano[2,3-*d*]pyrimidine-9,11- (10*H*)-dione (**4d**)

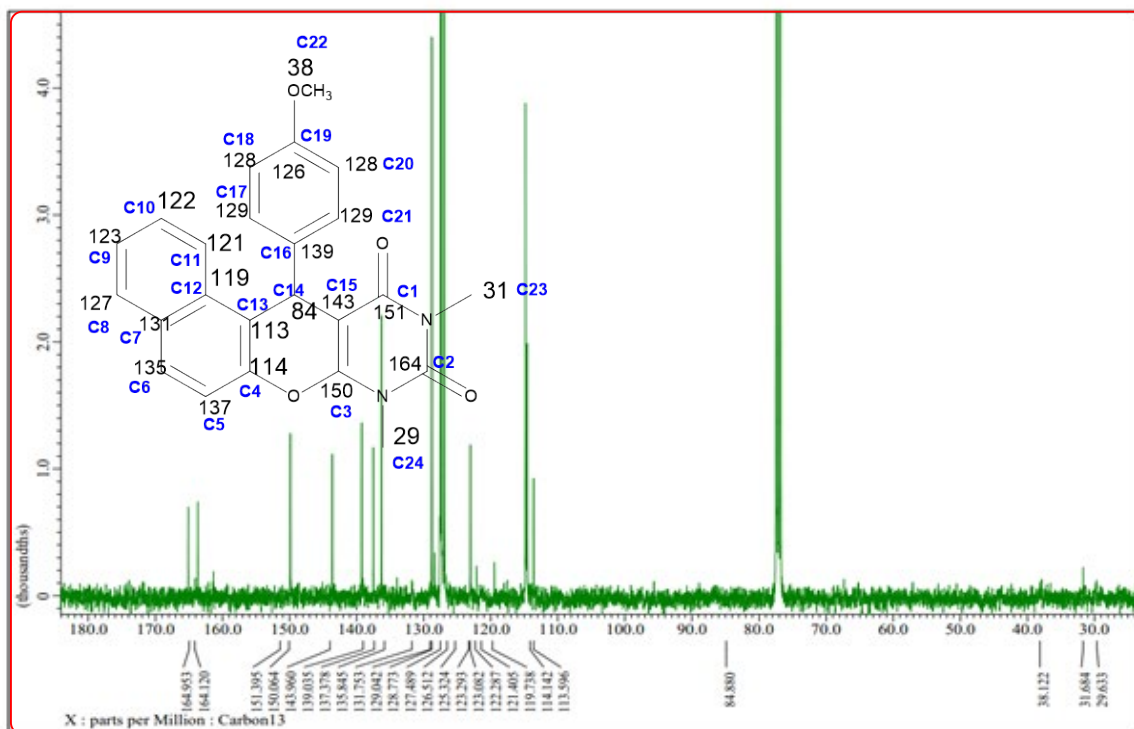


Fig. S11 — ¹³C-NMR spectrum of 12-(4-Methoxyphenyl)-8,12-dihydro-8,10-dimethyl-9H-naphtho[1',2':5,6]pyrano[2,3-d]pyrimidine-9,11- (10H)-dione (**4d**)

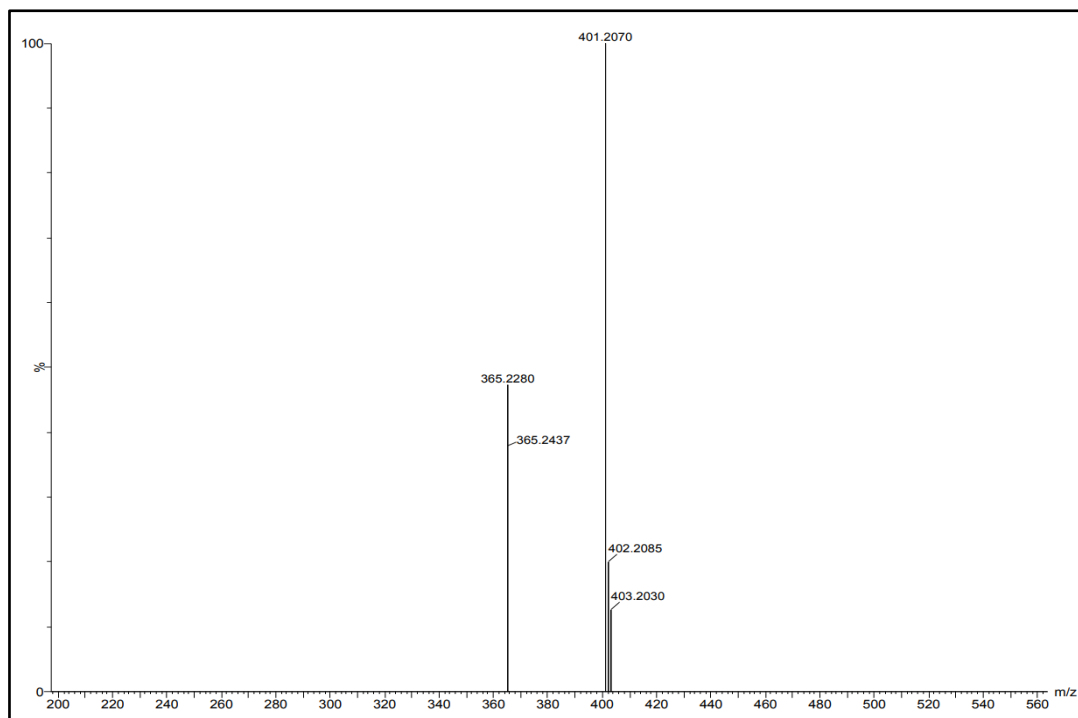


Fig. S12 — Mass spectrum of 12-(4-Methoxyphenyl)-8,12-dihydro-8,10-dimethyl-9H-naphtho[1',2':5,6]pyrano[2,3-d]pyrimidine-9,11- (10H)-dione (**4d**)

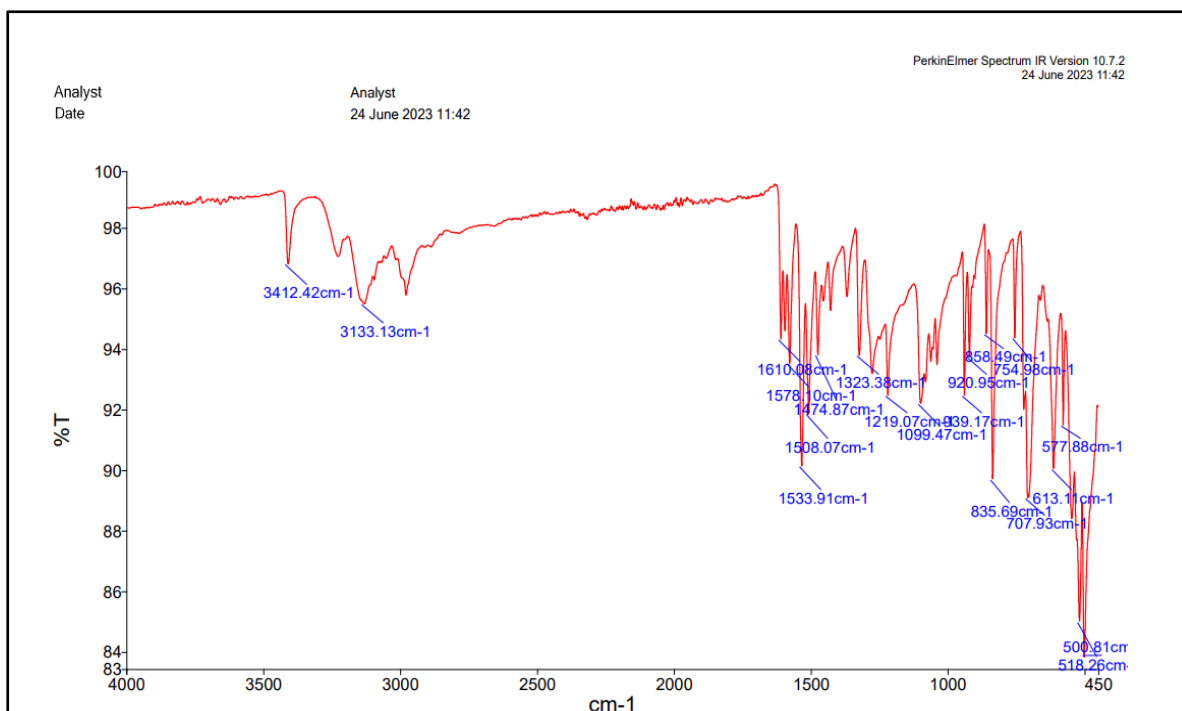


Fig. S13 — FT-IR Spectrum of 5-(4-pyridinyl)-1,2,4-triazolidine-3-thione (**6d**)

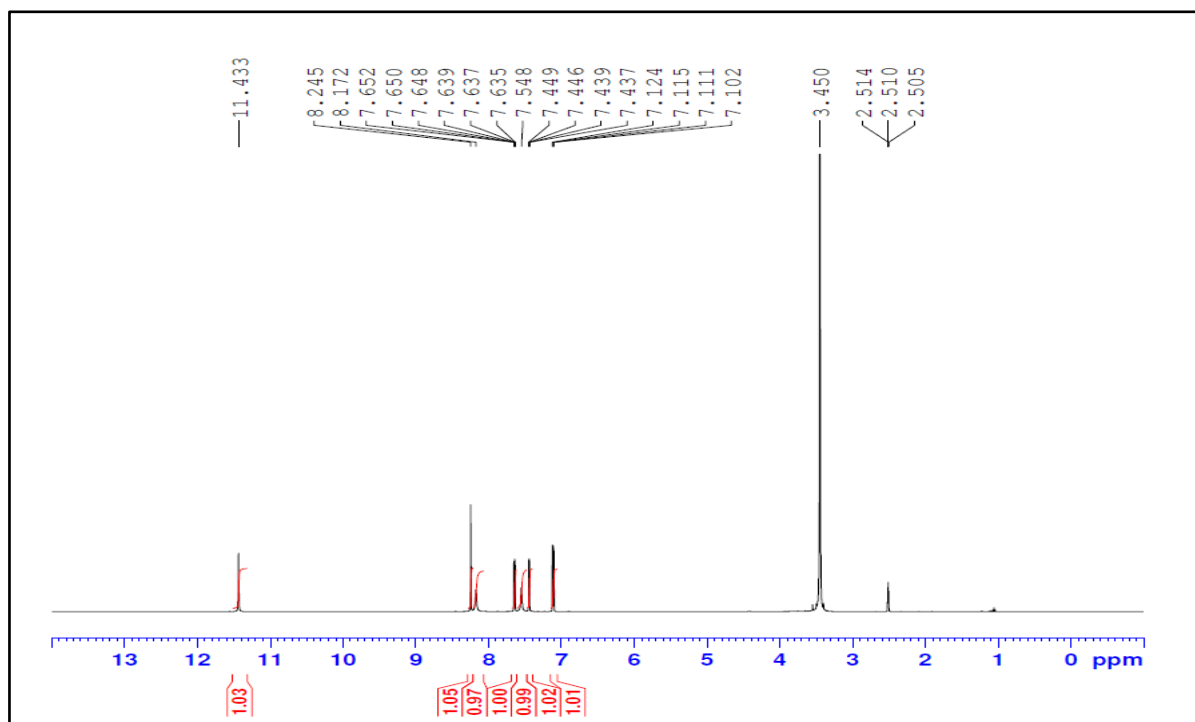


Fig. S14 — $^1\text{H-NMR}$ Spectrum of 5-(4-pyridinyl)-1,2,4-triazolidine-3-thione (**6d**)

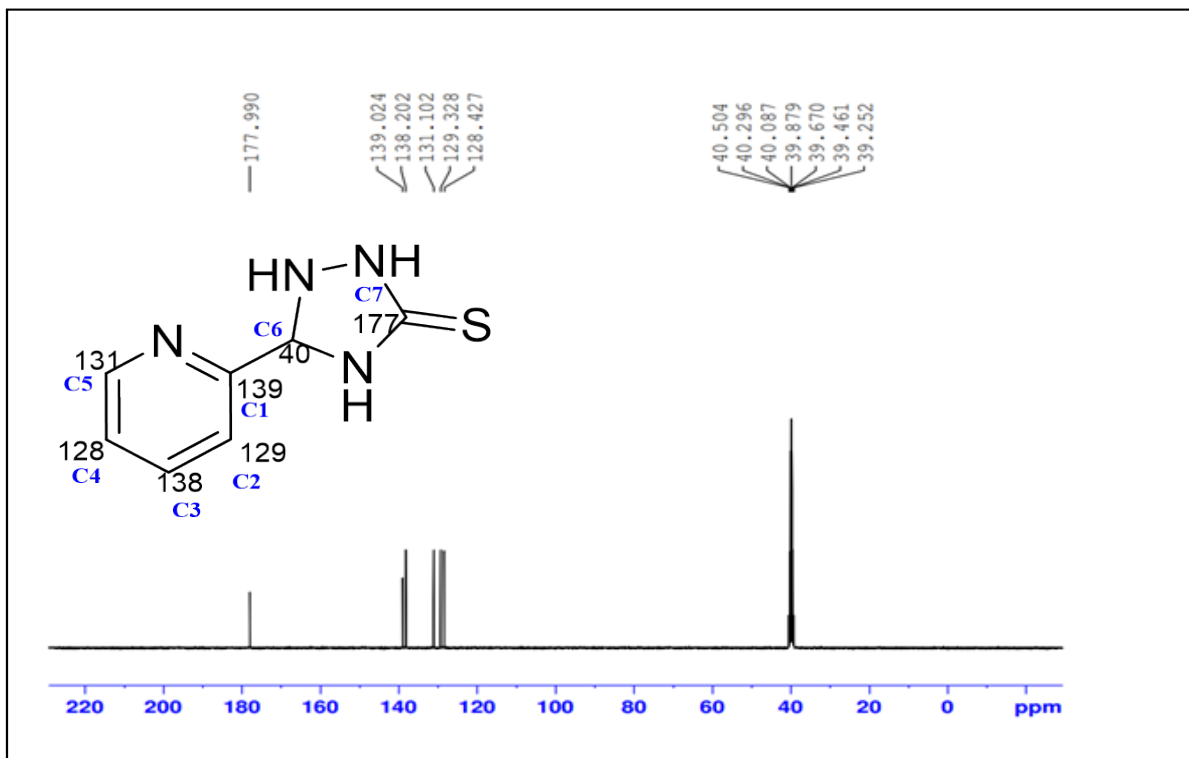


Fig. S15 — ¹³C-NMR spectrum of 5-(4-pyridinyl)-1,2,4-triazolidine-3-thione (**6d**)

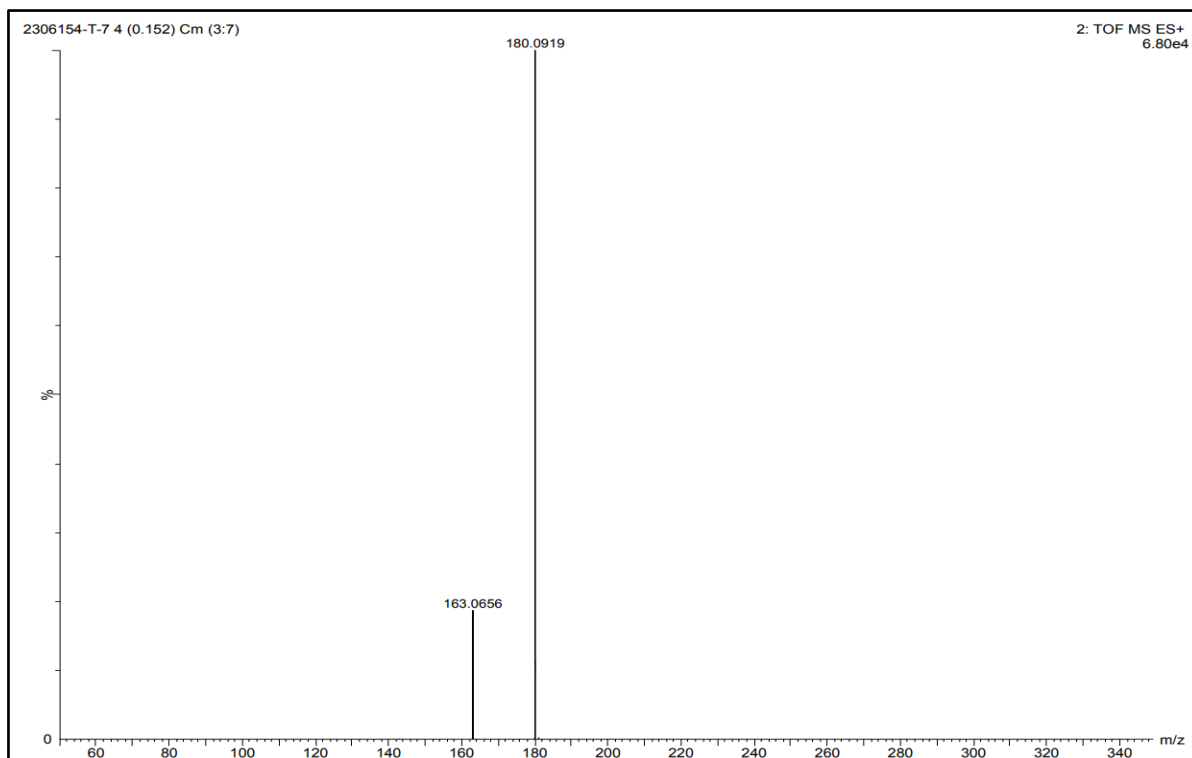


Fig. S16 — Mass spectrum of 5-(4-pyridinyl)-1,2,4-triazolidine-3-thione (**6d**)

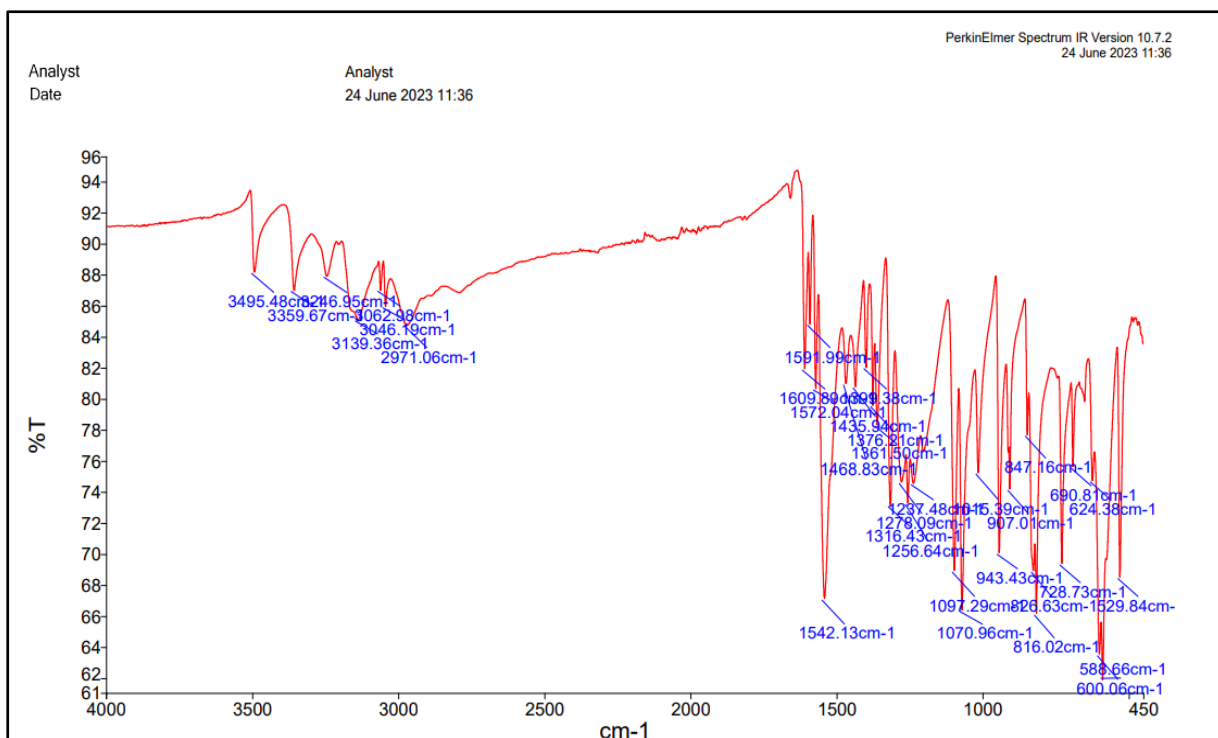


Fig. S17 — FT-IR spectrum of 5-(5-methylthiazol-4-yl)-1,2,4-triazolidine-3-thione (**6e**)

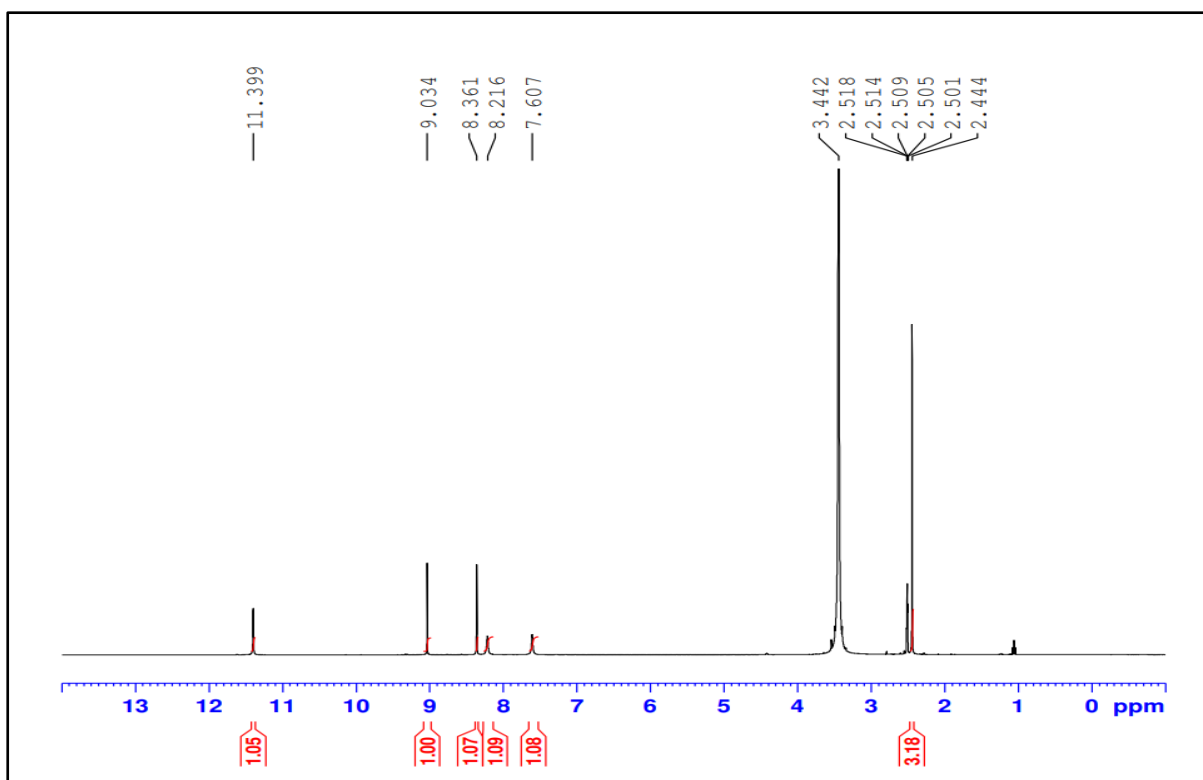


Fig. S18 — ¹H-NMR spectrum of 5-(5-methylthiazol-4-yl)-1,2,4-triazolidine-3-thione (**6e**)

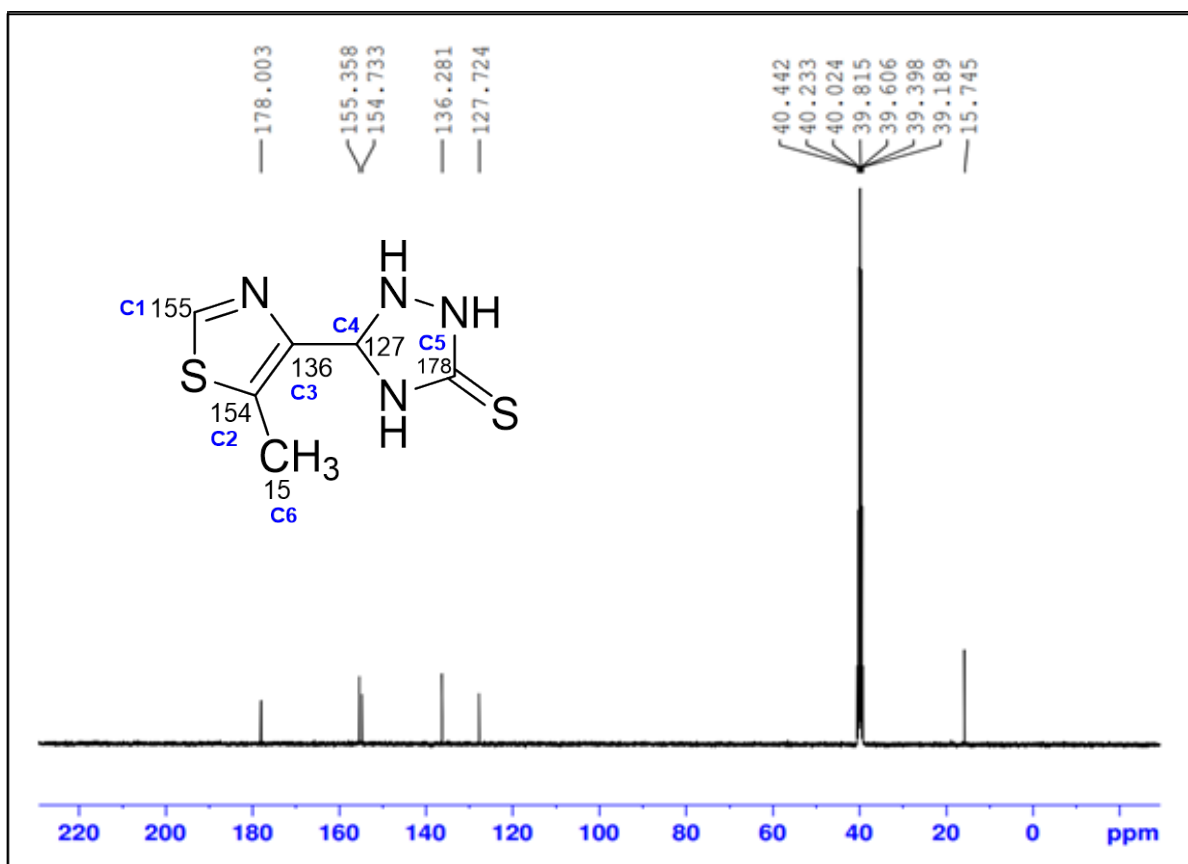


Fig. S19 — ¹³C-NMR spectrum of 5-(5-methylthiazol-4-yl)-1,2,4-triazolidine-3-thione (**6e**)

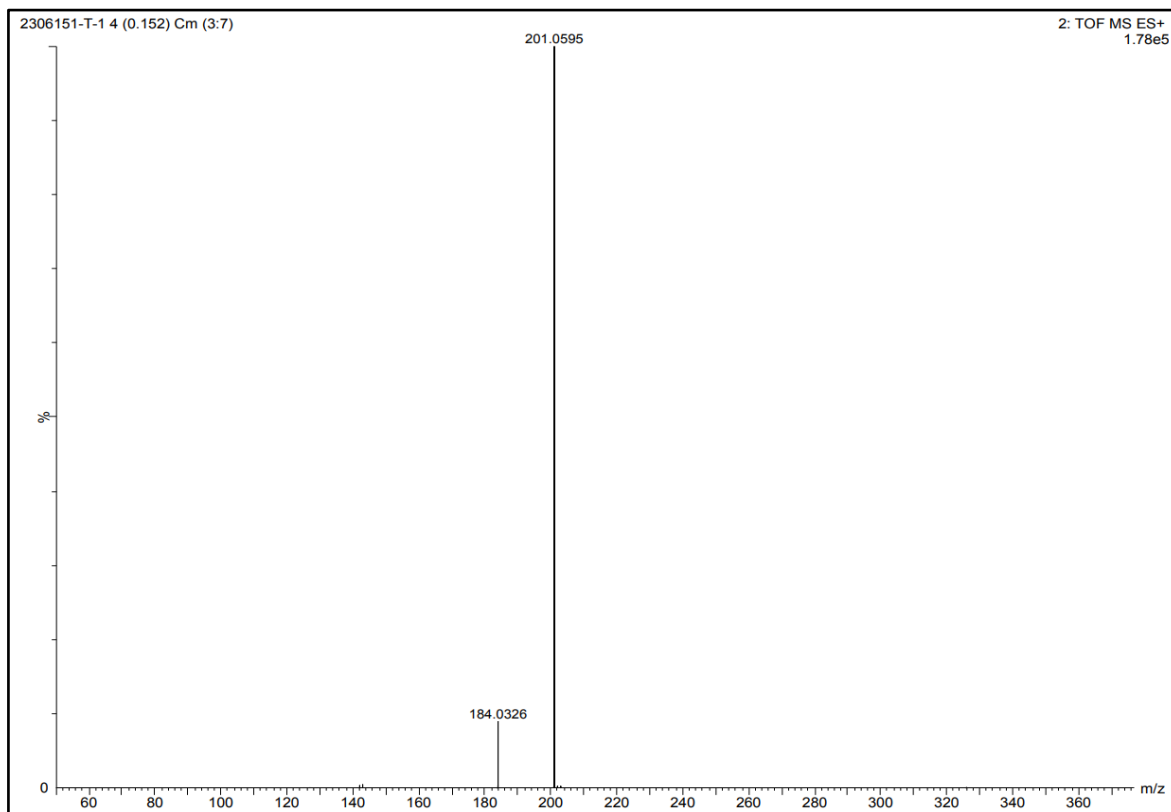


Fig. S20 — Mass spectrum of 5-(5-methylthiazol-4-yl)-1,2,4-triazolidine-3-thione (**6e**)

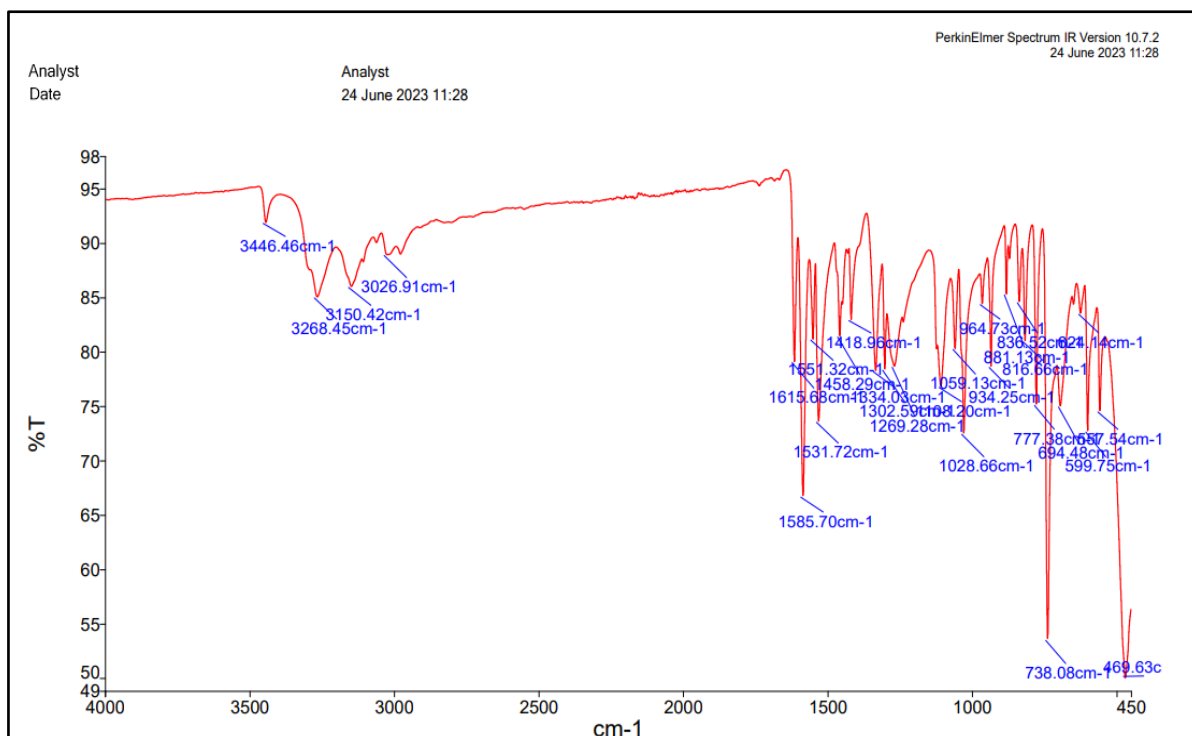


Fig. S21 — FT-IR Spectrum of 5-(1H-pyrrol-2-yl)-1,2,4-triazolidine-3-thione (**6g**)

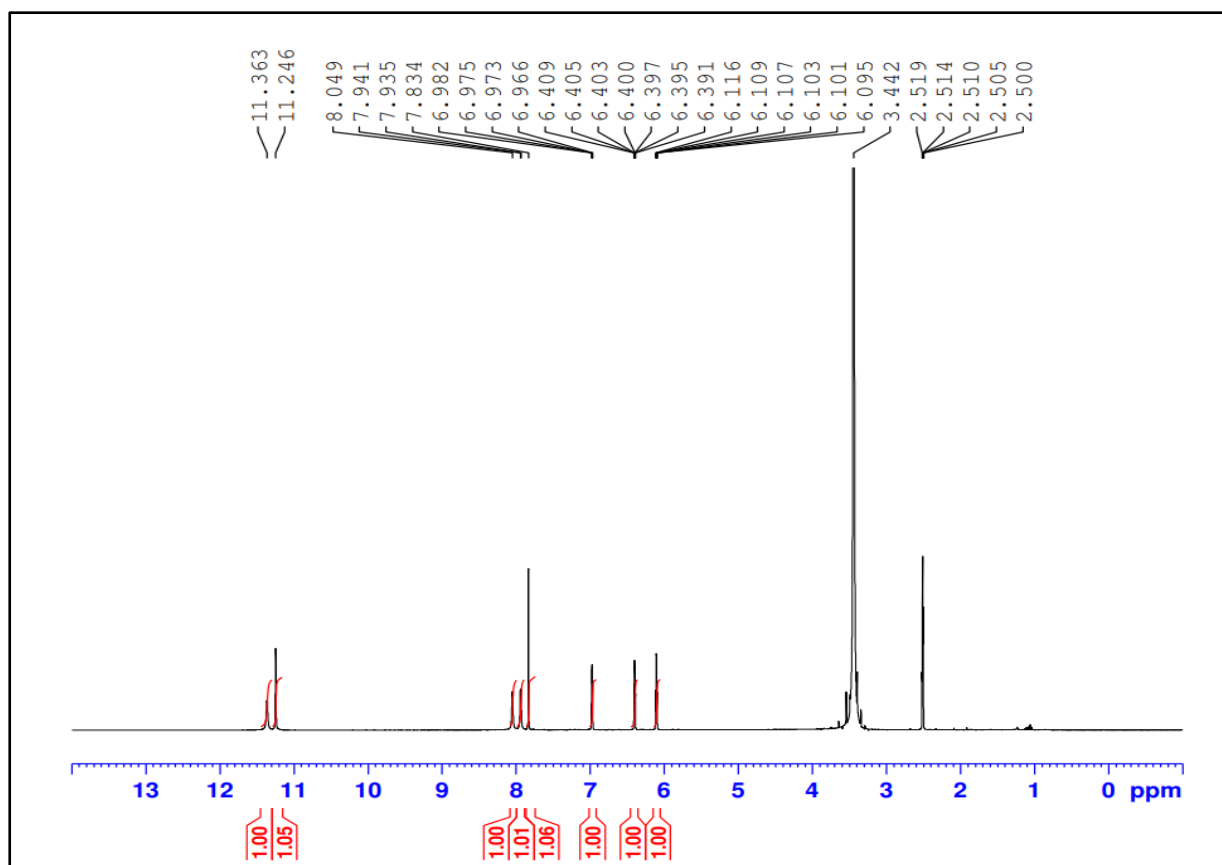


Fig. S22 — ¹H-NMR Spectrum of 5-(1H-pyrrol-2-yl)-1,2,4-triazolidine-3-thione (**6g**)

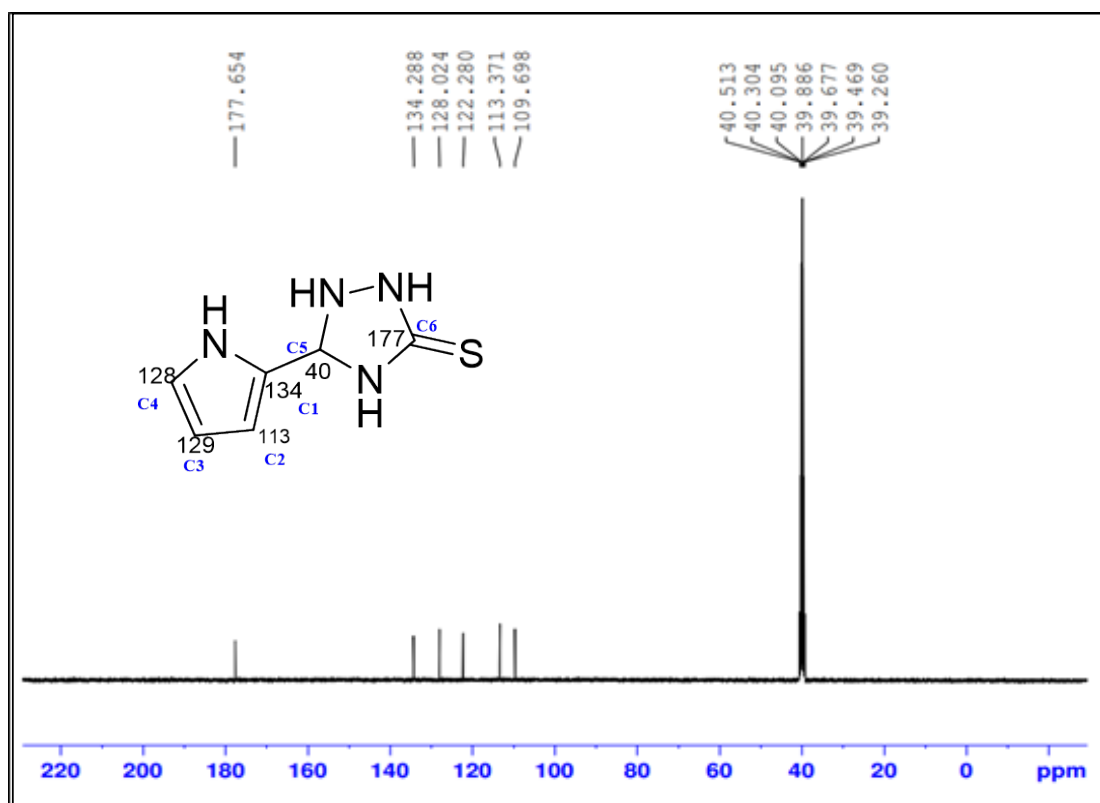


Fig. S23 — ^{13}C -NMR spectrum of 5-(1H-pyrrol-2-yl)-1,2,4-triazolidine-3-thione (**6g**)

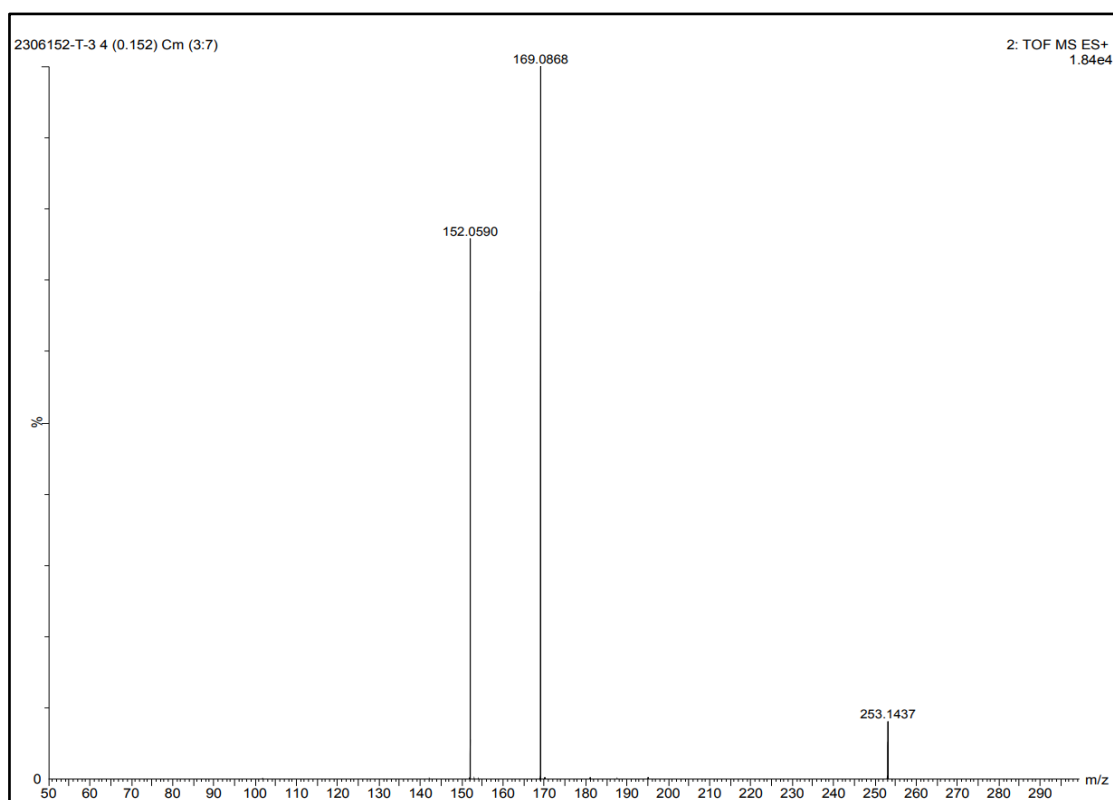


Fig. S24 — Mass Spectrum of 5-(1H-pyrrol-2-yl)-1,2,4-triazolidine-3-thione (**6g**)

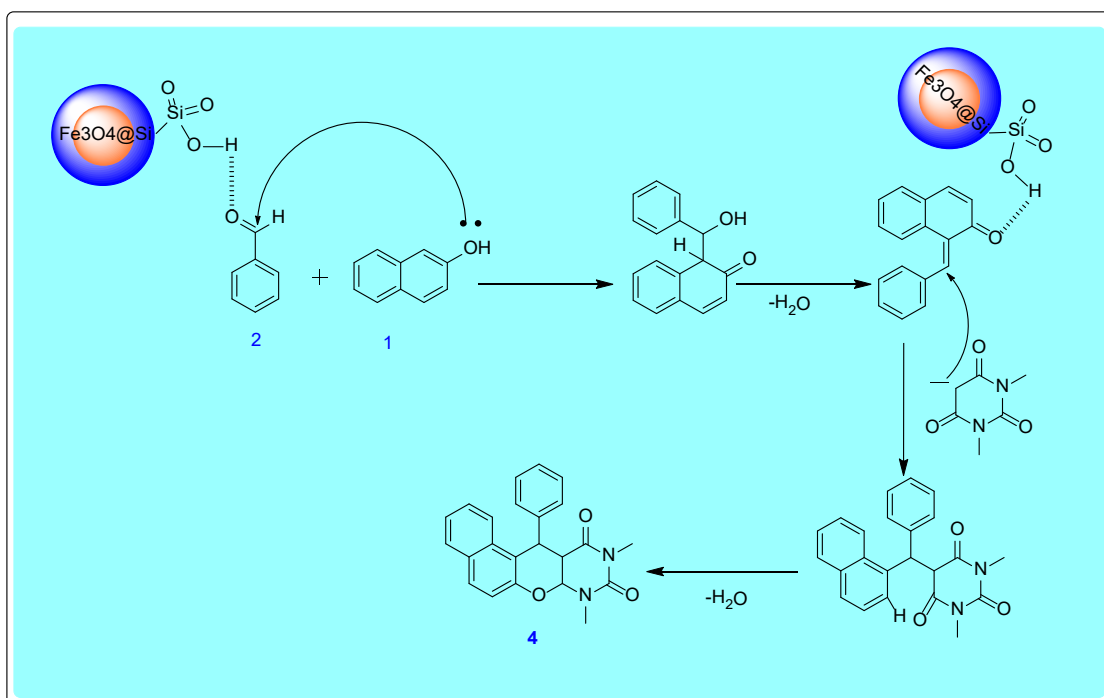


Fig. S25 — Plausible mechanism for the synthesis of naphthapyranopyrimidines

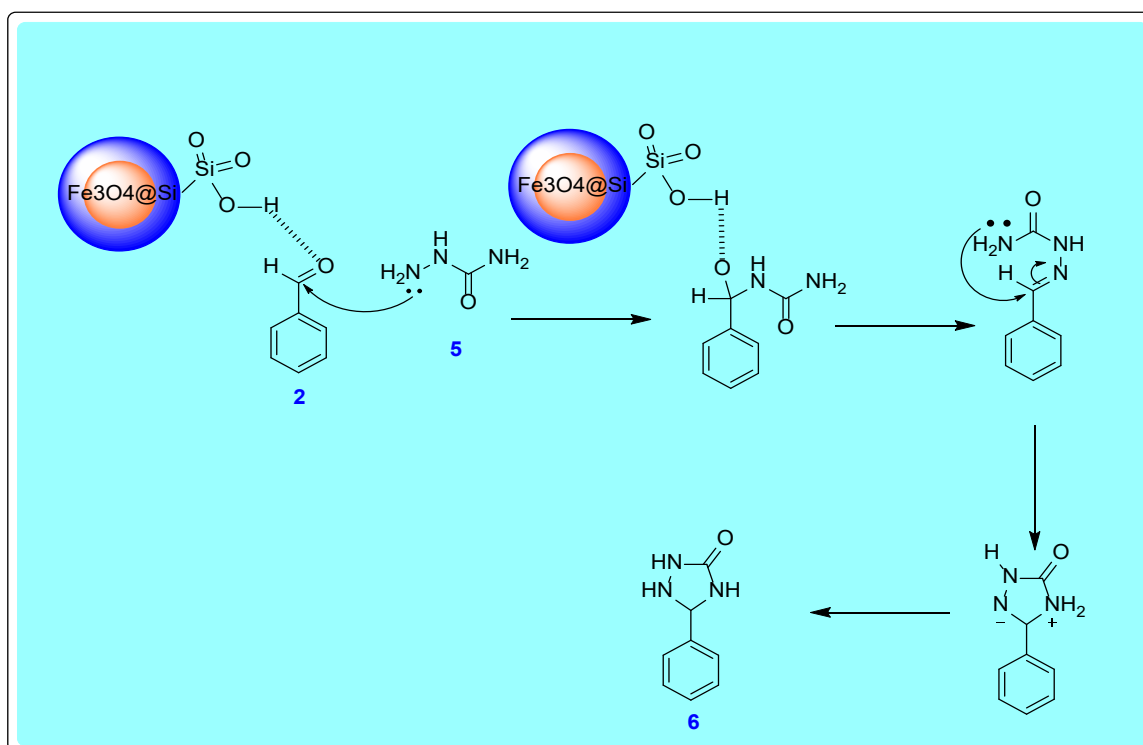


Fig. S26 — Plausible mechanism for the synthesis of 5-aryl-1, 2, 4-triazolidine-3-thione