SUPPORTING INFORMATION

Controlled alcohol oxidation reactions by supported non-noble metal nanoparticles on chitin-derived *N*-doped carbons

Daniele Polidoro,[1] Daniel Ballesteros-Plata,[2] Alvise Perosa,[1] Enrique Rodríguez-Castellón,[2] Daily Rodríguez-Padrón,[1,] Maurizio Selva[1]**

[1] Dipartimento di Scienze Molecolari e Nanosistemi, UniversitàCa' Foscari di Venezia, 30123 Venezia, Italy

[2] Department of Inorganic Chemistry, Facultad de Ciencias, Universidad de Málaga, Campus de Teatinos s/n, 29071 Málaga, Spain

Characterization data

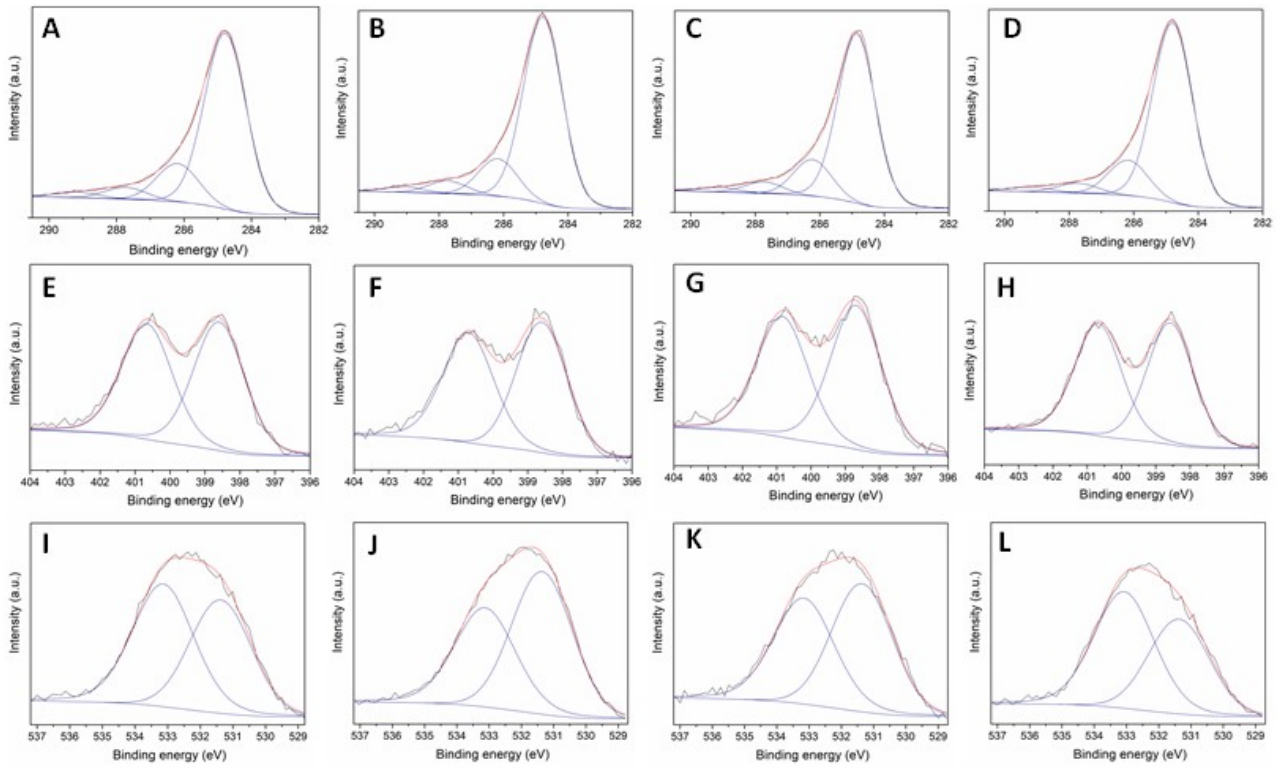

Figure S1. XPS spectra of the prepared materials. C 1*s* core level pectra of A: Ni-N/C, B: Fe-N/C, C: Co-N/C and D: Mo-N/C. N 1*s* core level spectra of E: Ni-N/C, F: Fe-N/C, G: Co-N/C and H: Mo-N/C. O 1*s* core level spectra of I: Ni-N/C, J: Fe-N/C, K: Co-N/C and L: Mo-N/C.

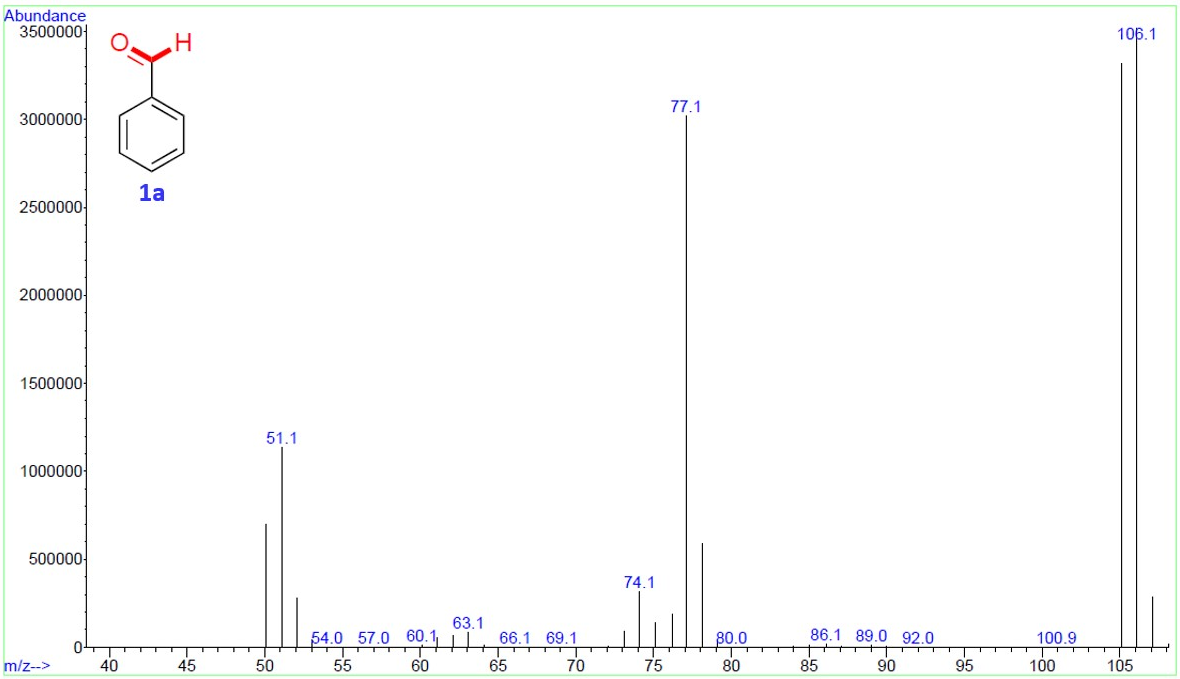

Figure S2. Mass Spectrum of **1a** (EI, 70 eV).

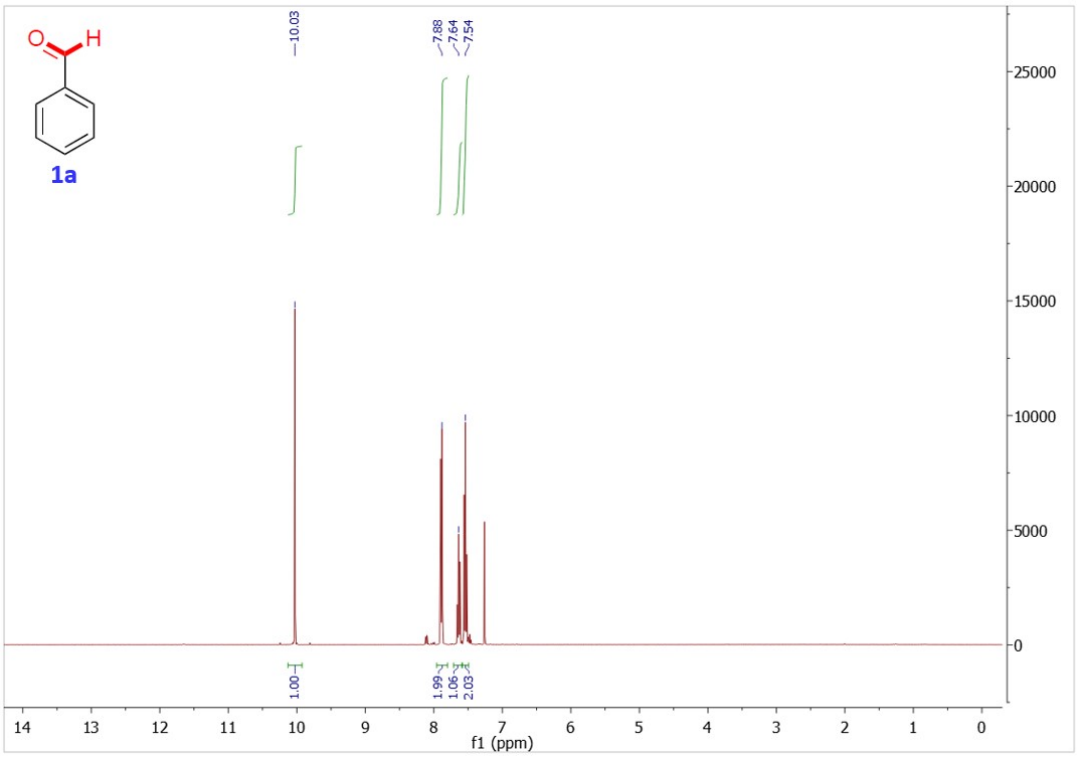

Figure S3. ^{1}H NMR of **1a**. ^{1}H NMR (400 MHz, 298 K, $CDCl_3$) δ 10.03 (s, 1H), 7.88 (m, 2H), 7.64 (t, 1H), 7.54 (m, 2H). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 10.03 (s, 1H), 7.93 – 7.85 (m, 2H), 7.69 – 7.57 (m, 1H), 7.58 – 7.43 (m, 2H).

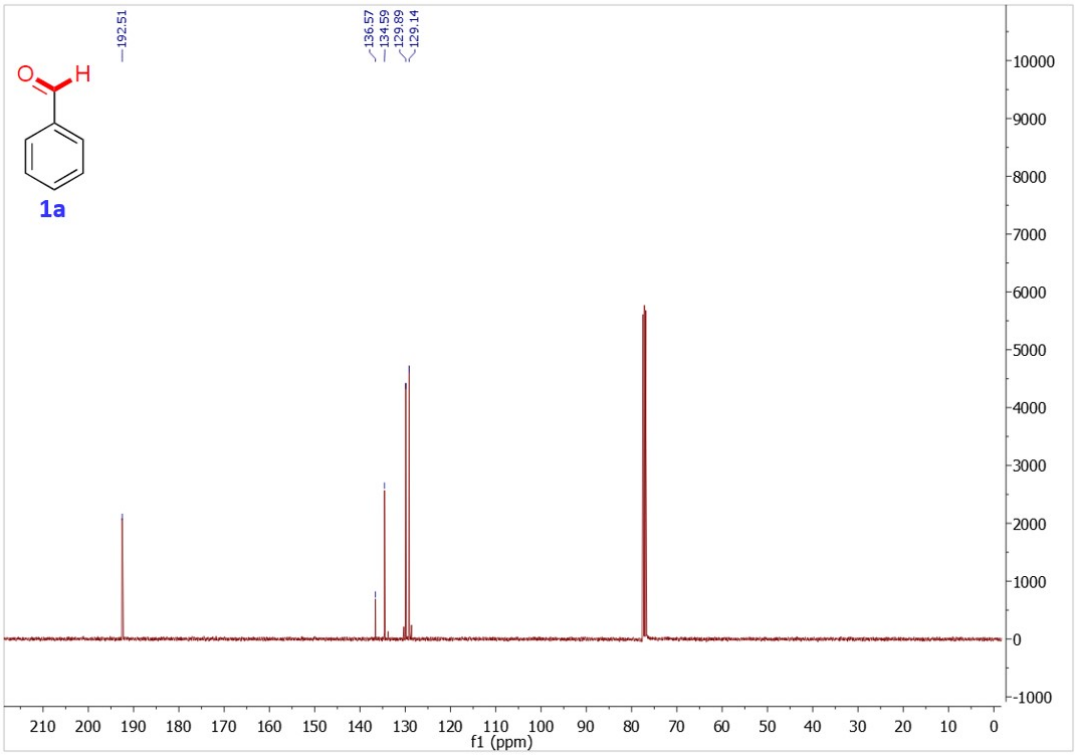

Figure S4. ^{13}C NMR of **1a**. ^{13}C NMR (101 MHz, 298 K, $CDCl_3$) δ 192.51, 136.57, 134.59, 129.89, 129.14.

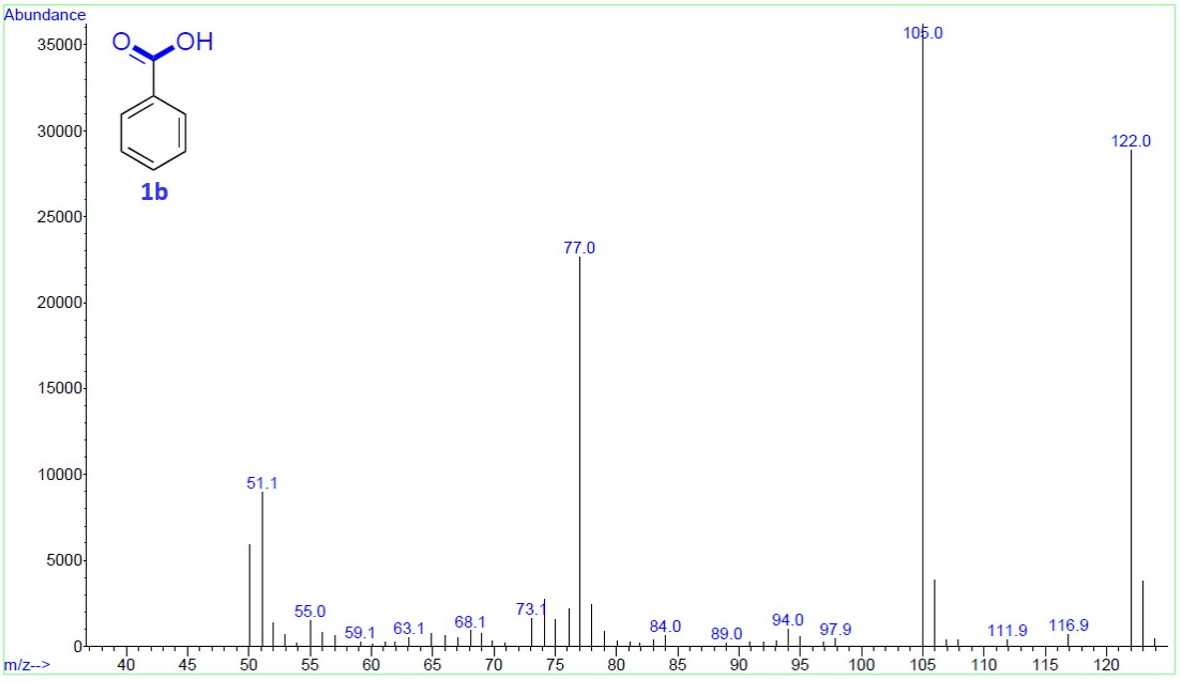

Figure S5. Mass Spectrum of **1b** (EI, 70 eV).

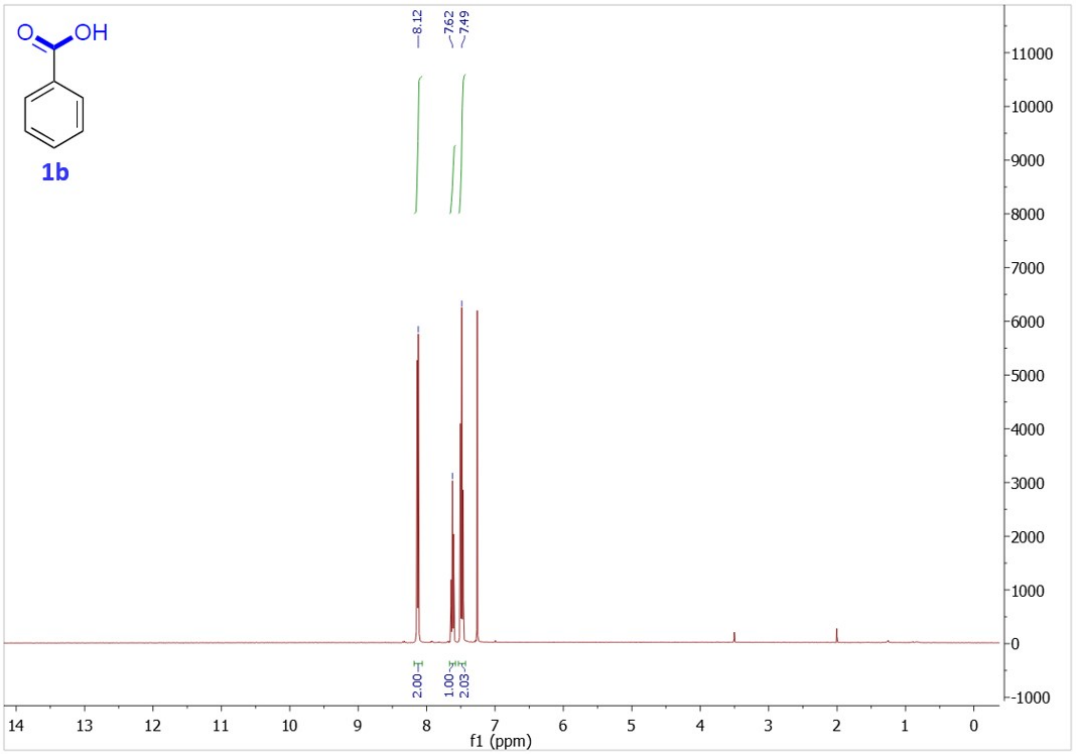

Figure S6. ^{1}H NMR of **1b**. ^{1}H NMR (400 MHz, 298 K, $CDCl_3$) δ 8.12 (m, 2H), 7.62 (m, 1H), 7.49 (d, 2H). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.17 – 8.09 (m, 2H), 7.67 – 7.58 (m, 1H), 7.49 (dd, *J* = 8.4, 7.1 Hz, 2H).

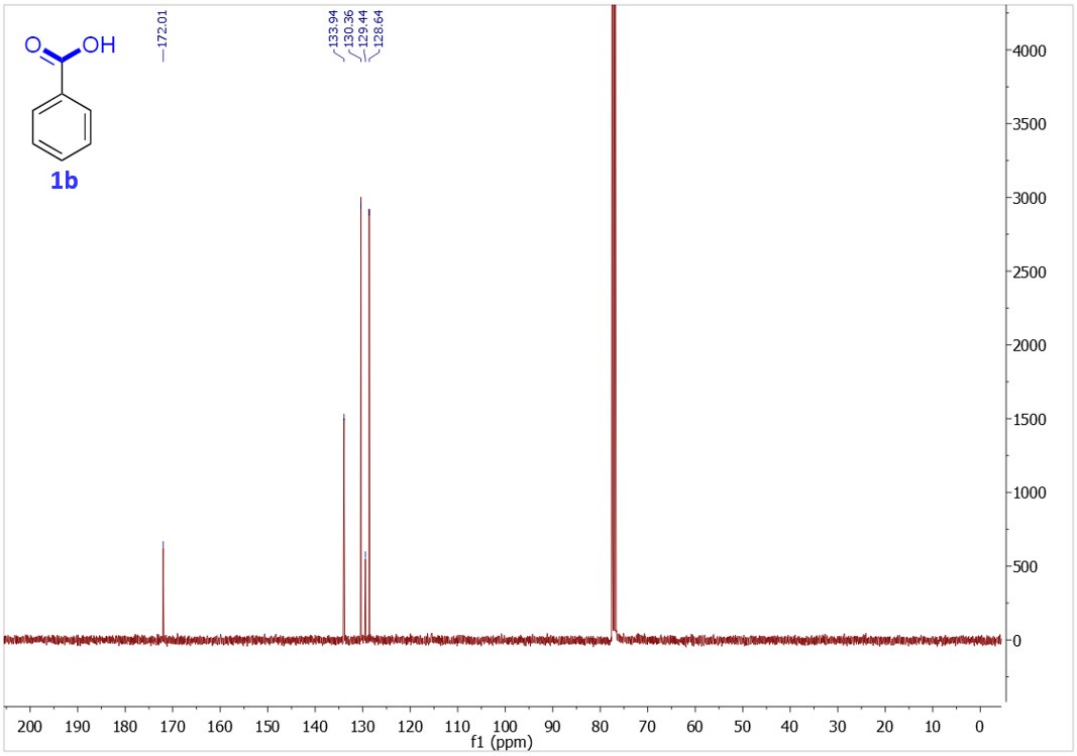

Figure S7. ^{13}C NMR of **1b**. ^{13}C NMR (101 MHz, 298 K, $CDCl_3$) δ 172.01, 133.94, 130.36, 129.44, 128.64.

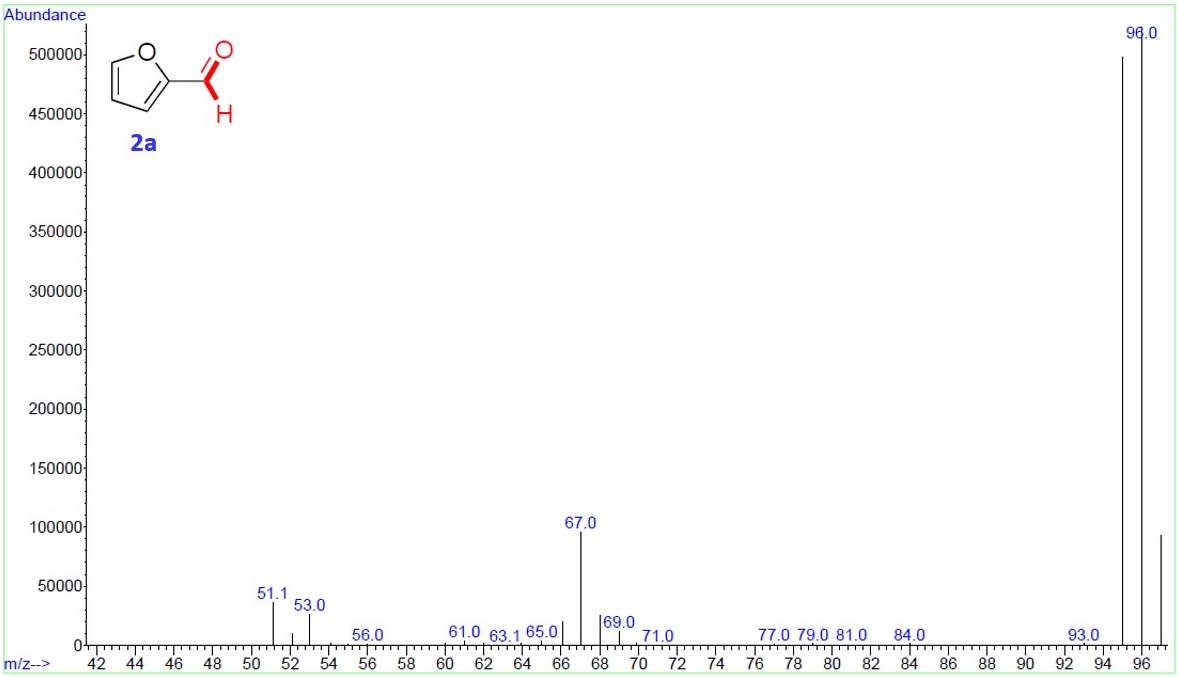

Figure S8. Mass Spectrum of **2a** (EI, 70 eV).

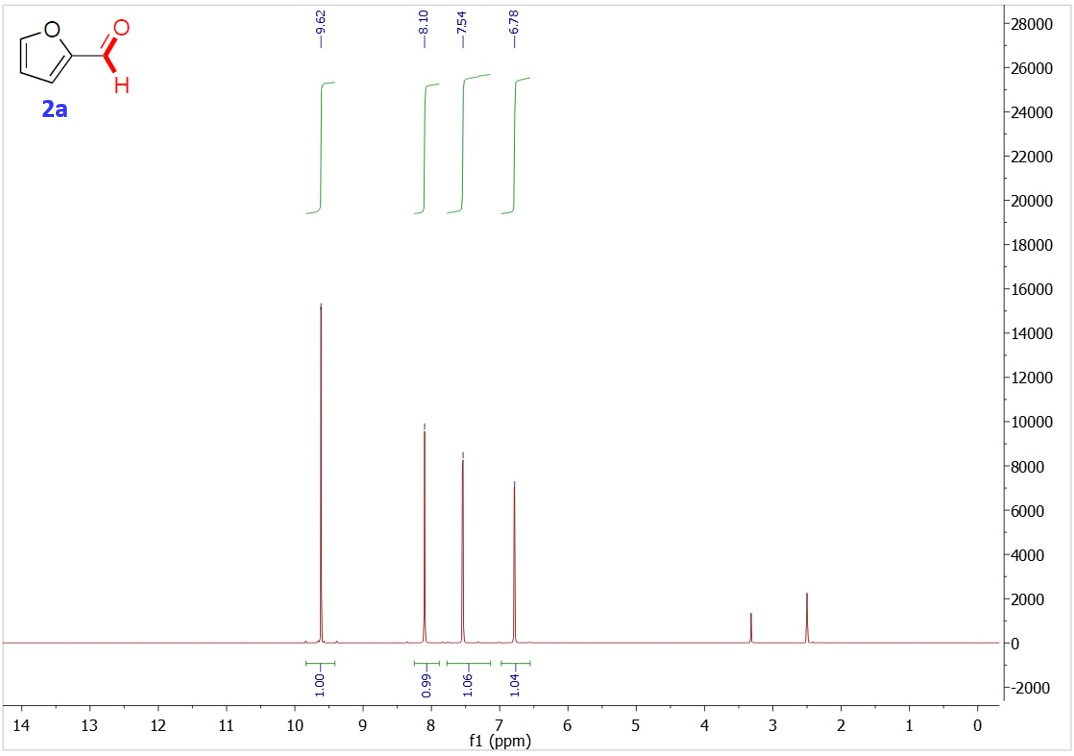

Figure S9. ^{1}H NMR of **2a**. ^{1}H NMR (400 MHz, 298 K, DMSO-d_6) δ 9.62 (s, 1H), 8.10 (d, 1H), 7.54 (t, 1H), 6.78 (d, 1H). ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.62 (s, 1H), 8.10 (dt, J = 1.7, 0.8 Hz, 1H), 7.54 (dd, J = 3.7, 0.8 Hz, 1H), 6.78 (dd, J = 3.6, 1.7 Hz, 1H).

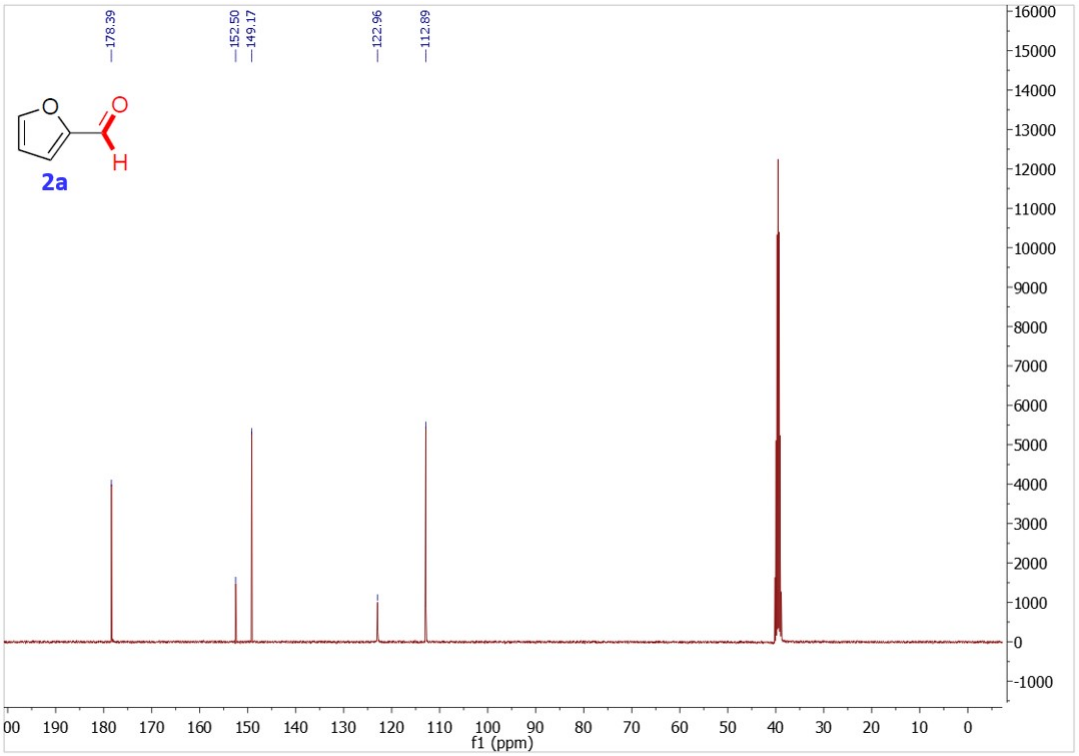

Figure S10. ^{13}C NMR of **2a**. ^{13}C NMR (101 MHz, 298 K, DMSO-d_6) δ 178.39, 152.50, 149.17, 122.96, 112.89.

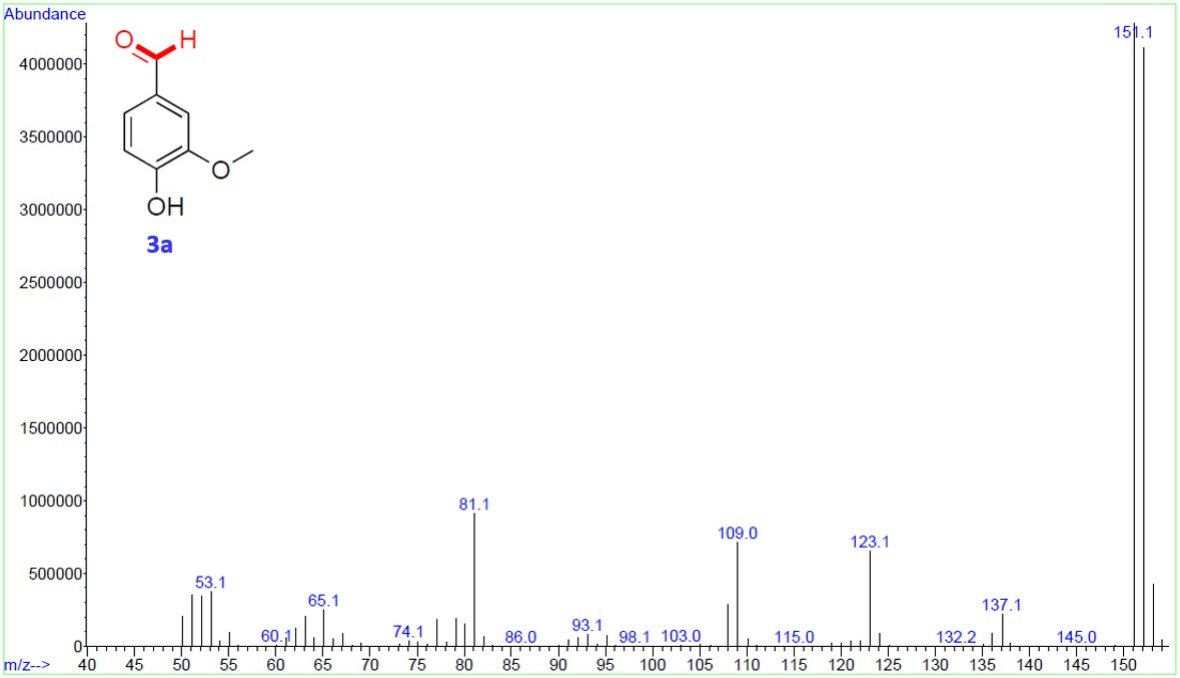

Figure S11. Mass Spectrum of **3a** (EI, 70 eV).

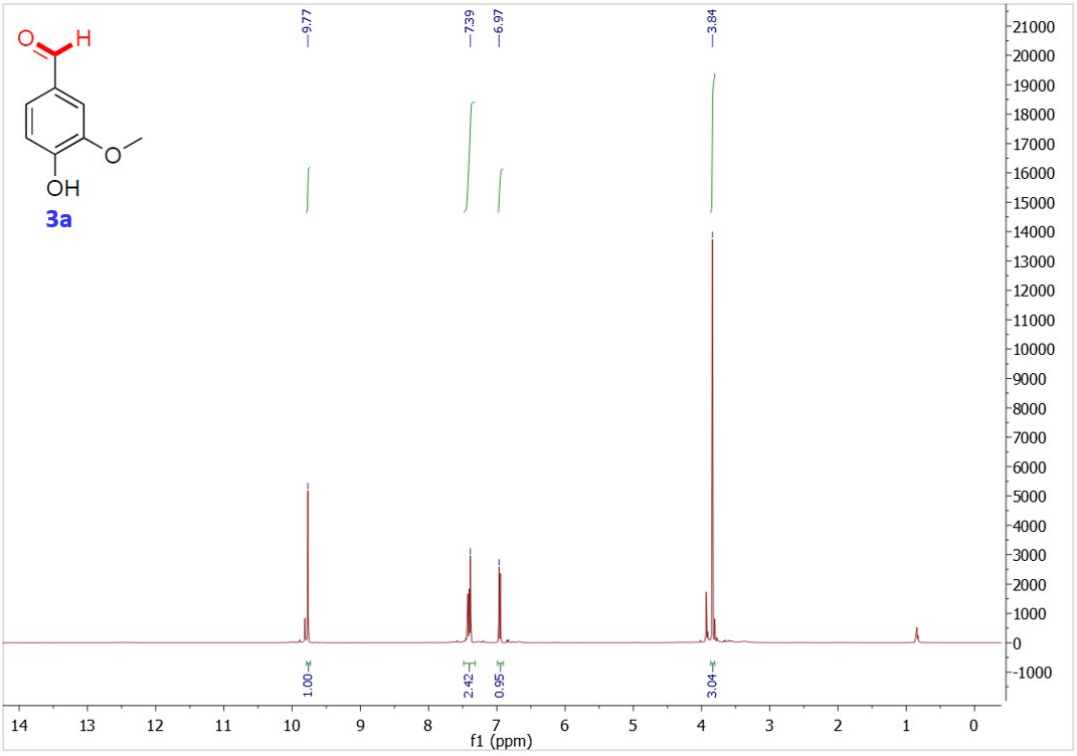

Figure S12. ^{1}H NMR of **3a**. ^{1}H NMR (400 MHz, 298 K, DMSO-d_6) δ 9.77 (s, 1H), 7.39 (m, 2H), 6.97 (d, 1H), 3.84 (s, 3H). ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.77 (s, 1H), 7.59 – 7.27 (m, 2H), 6.97 (d, J = 8.0 Hz, 1H), 3.84 (s, 3H).

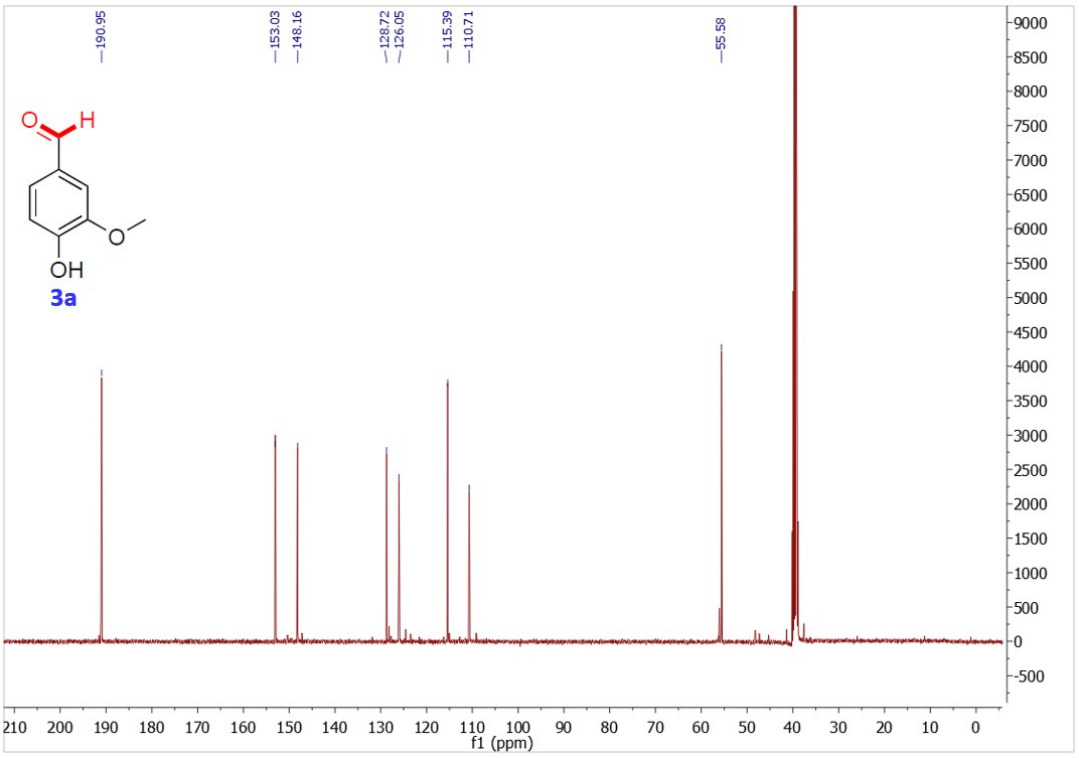

Figure S13. ^{13}C NMR of **3a**. ^{13}C NMR (101 MHz, 298 K, DMSO-d_6) δ 190.95, 153.03, 148.16, 128.72, 126.05, 115.39, 110.71, 55.58.

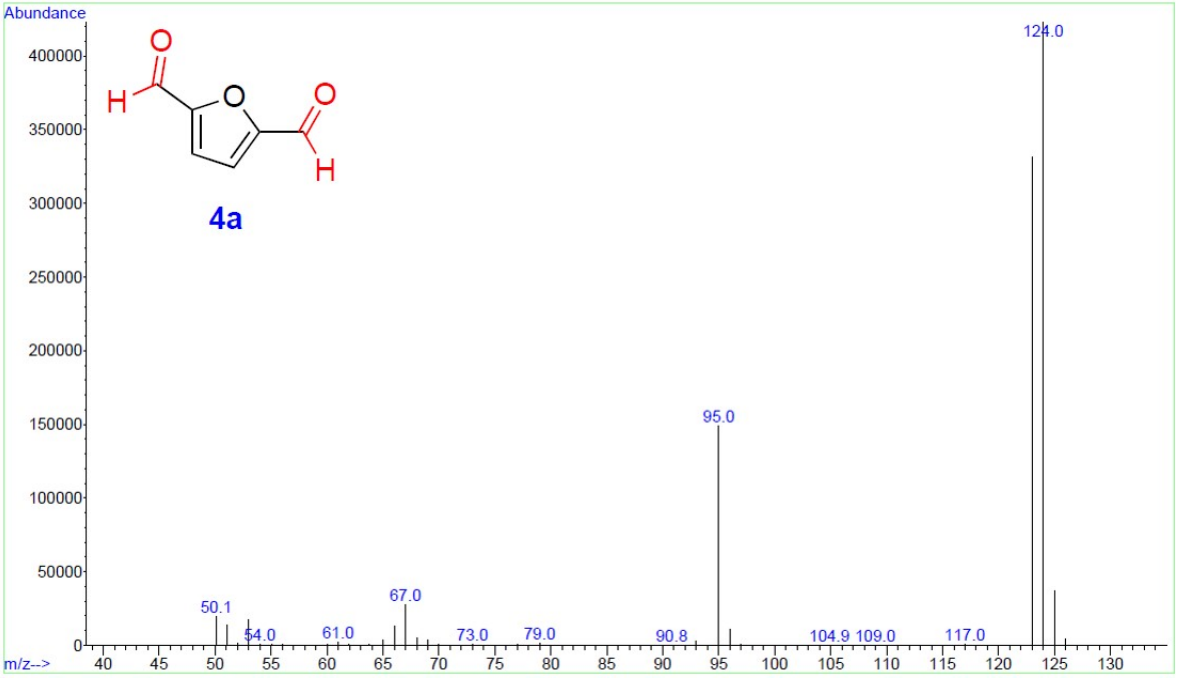

Figure S14. Mass Spectrum of **4a** (EI, 70 eV).

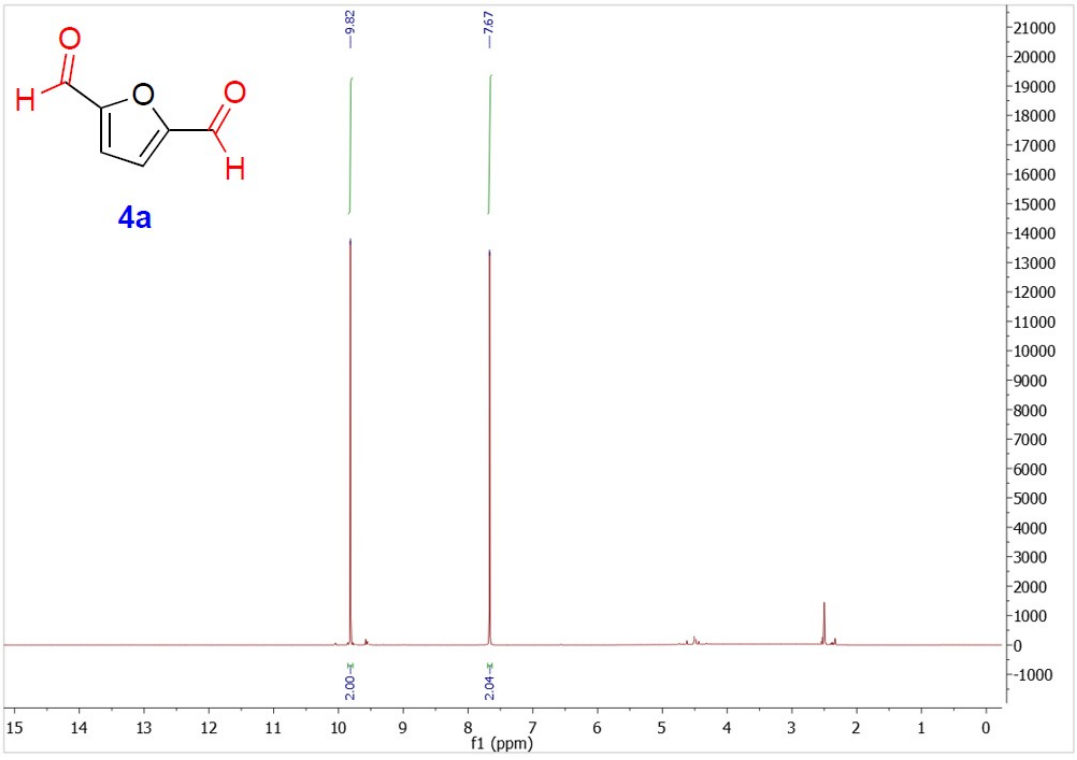

Figure S15. ^{1}H NMR of **34**. ^{1}H NMR (400 MHz, 298 K, DMSO-d_6) δ 9.82 (s, 2H), 7.67 (s, 2H).

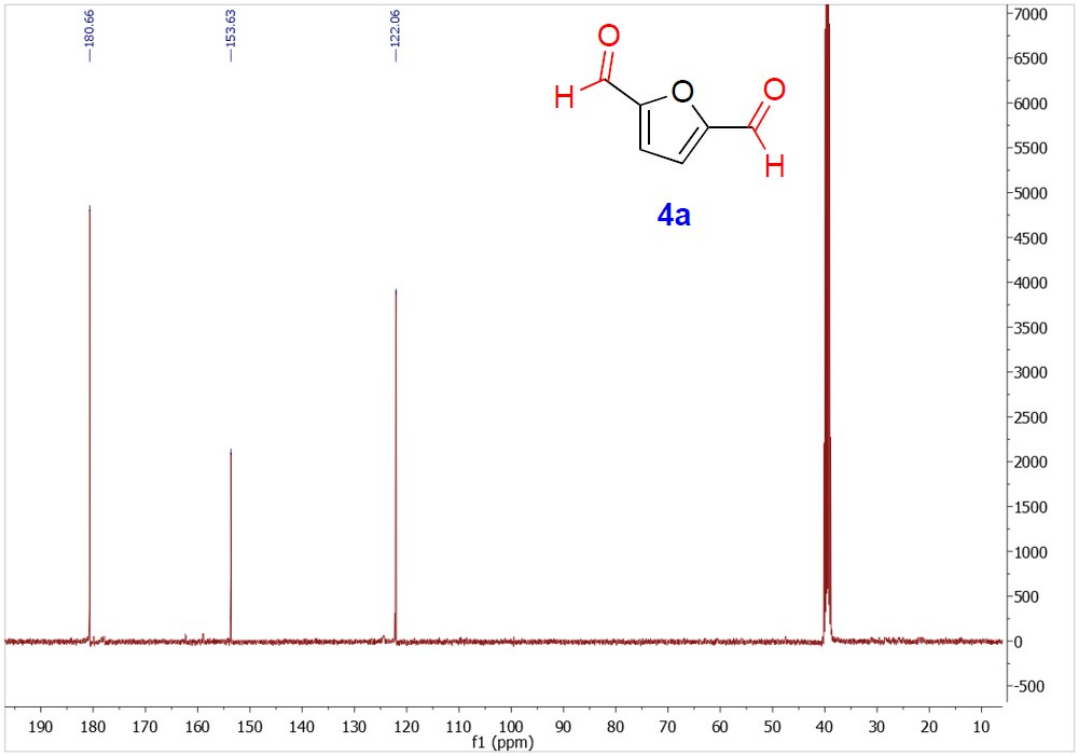

Figure S16. ^{13}C NMR of **4a**. ^{13}C NMR (101 MHz, 298 K, DMSO-d_6) δ 180.66, 153.63, 122.06.

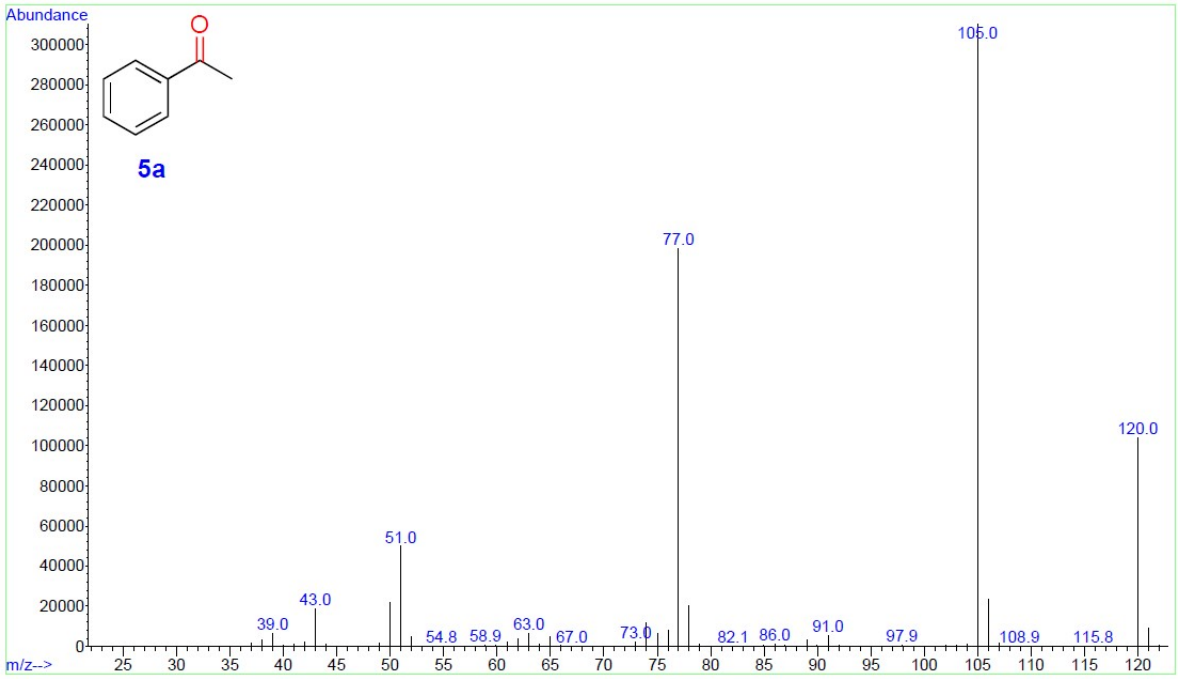

Figure S17. Mass Spectrum of **5a** (EI, 70 eV).

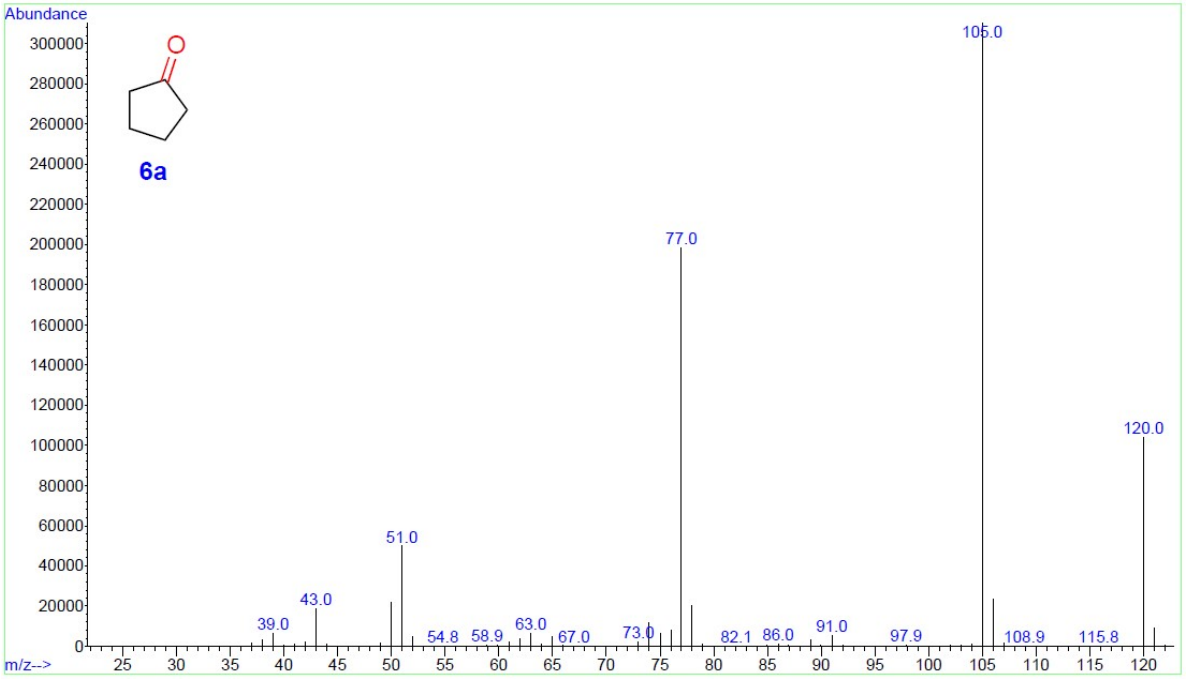

Figure S18. Mass Spectrum of **6a** (EI, 70 eV).

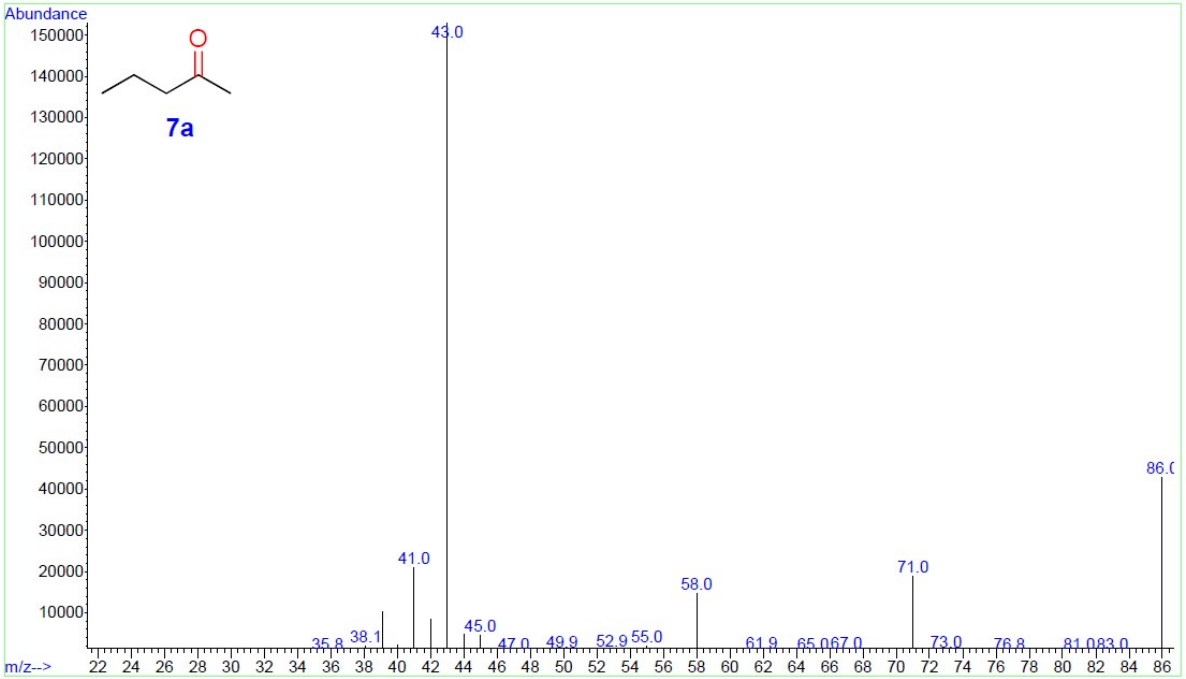

Figure S19. Mass Spectrum of **7a** (EI, 70 eV).

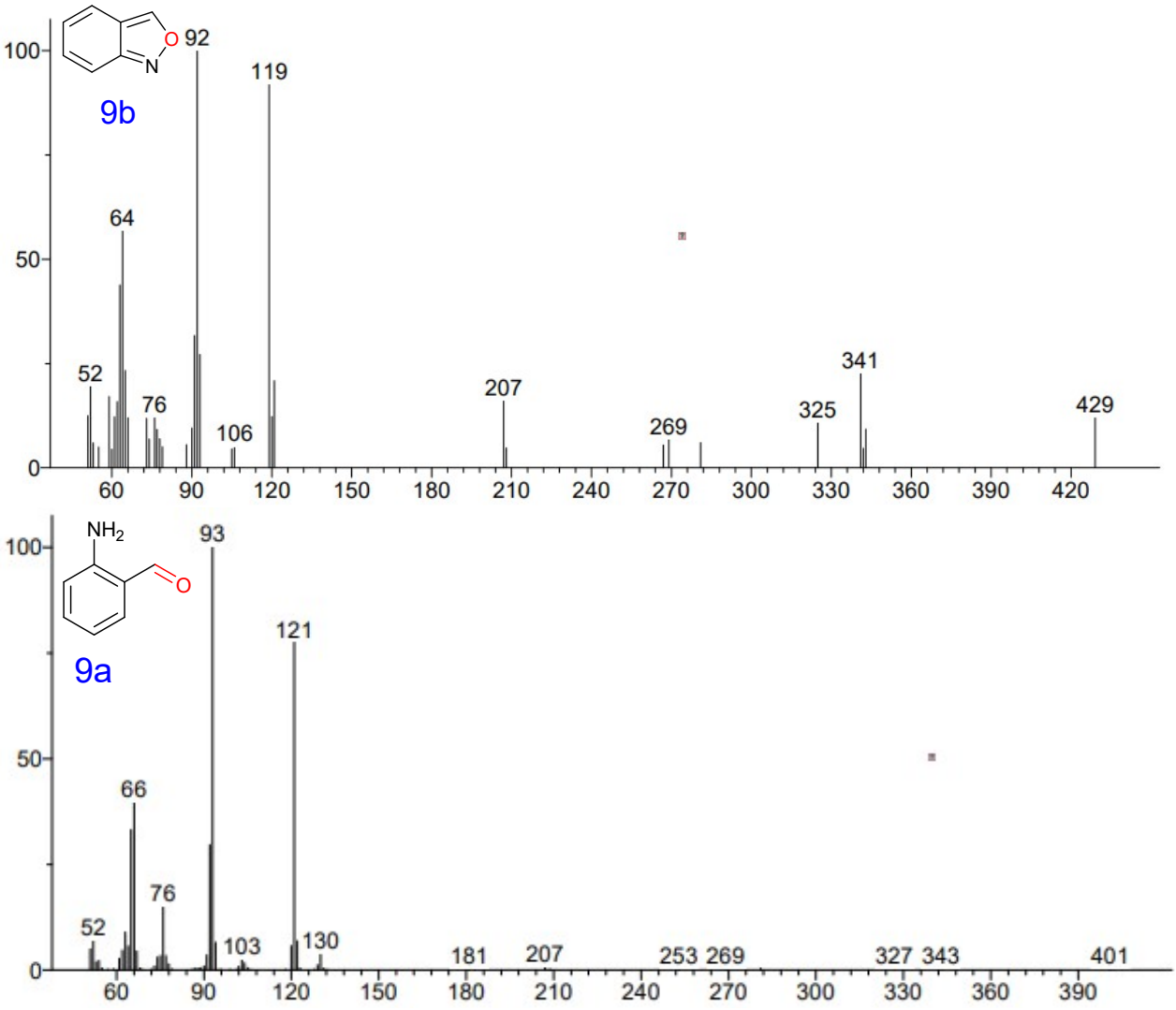

Figure S20. Mass Spectrum of **9a** (down) **and 9b** (top) (EI, 70 eV).

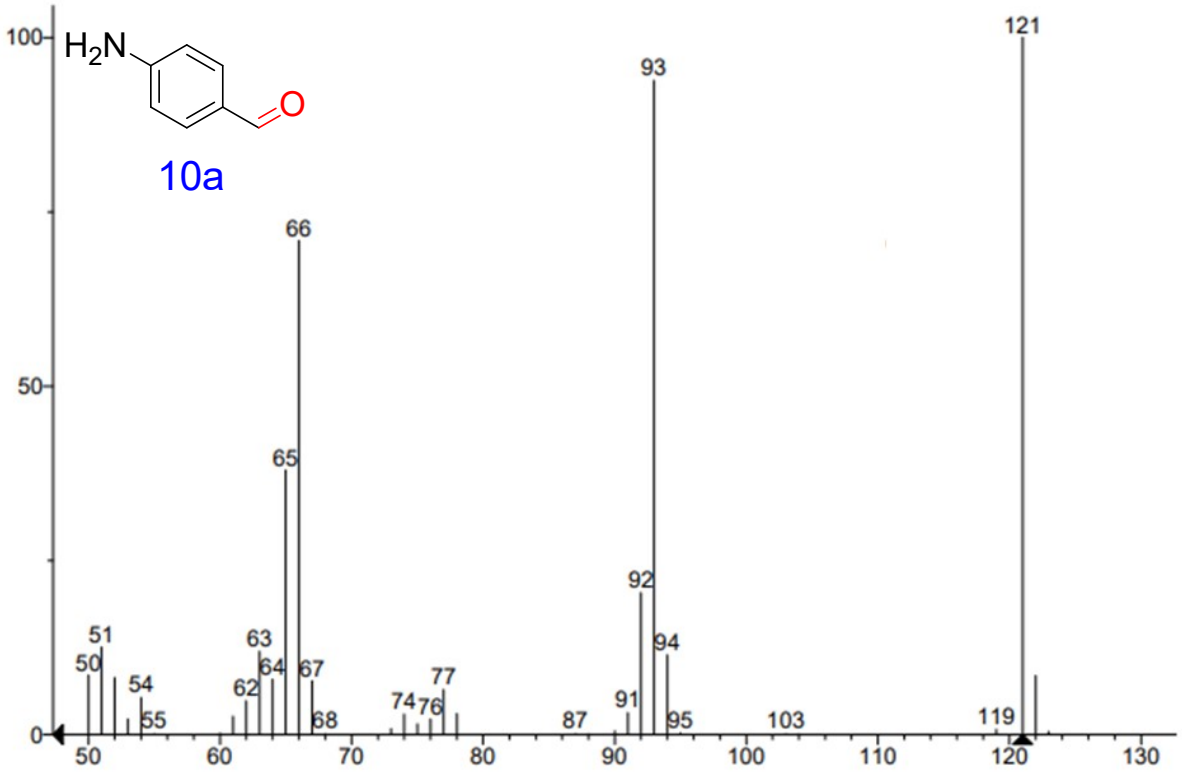

Figure S21. Mass Spectrum of **10a** (EI, 70 eV).

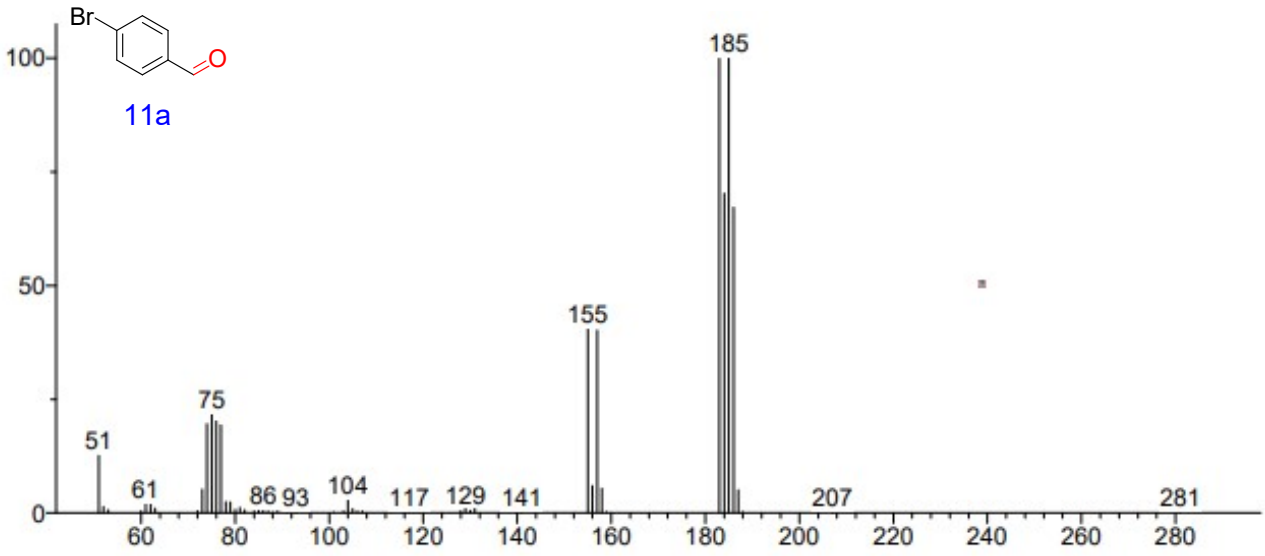

Figure S22. Mass Spectrum of **11a** (EI, 70 eV).

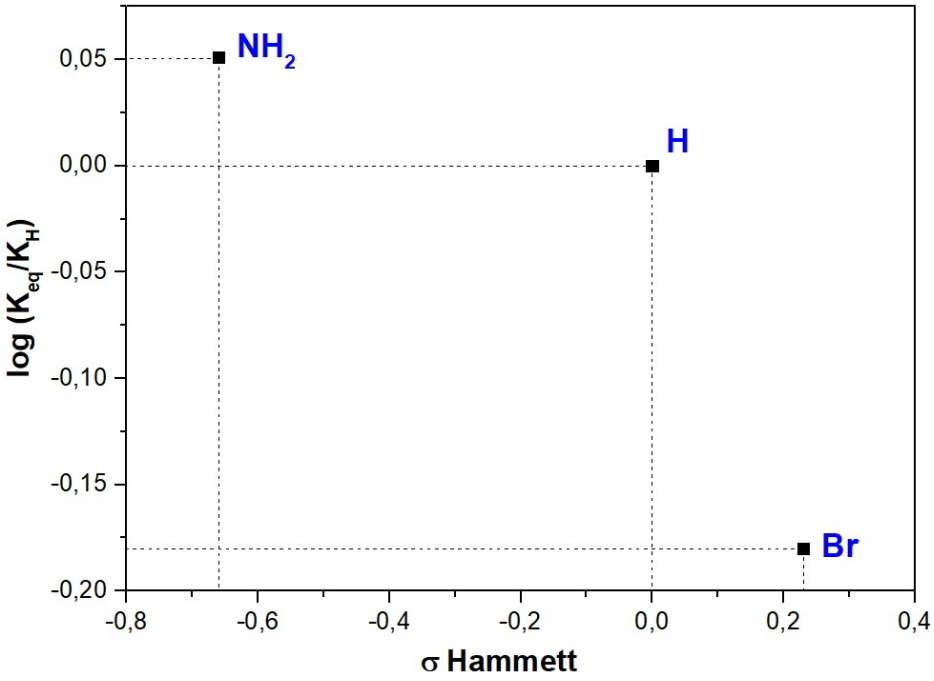

Figure S23. Free-energy linear relationship between equilibrium constants and Hammett's parameters.