**SUPPORTING INFORMATION TO**

**Glutamic acid as a green and bio-based *α*-amino acid catalyst promoted one-pot access to polyfunctionalized dihydro-2-oxypyrroles *via* imin-based four condensation domino reaction of amines, dialkyl acetylenedicarboxylaes and formaldehyde at room temperature**

FARZANEH MOHAMADPOUR a,\*

*a Young Researchers and Elite Club, Shiraz Branch, Islamic Azad University, Shiraz, Iran*

\**Corresponding author. mohamadpour.f.7@gmail.com*

*Methyl4-(4-ethylphenylamino)-1-(4-ethylphenyl)-2,5-dihydro-5-oxo-1H-pyrrole-3-carboxylate (5f) (Table II, entry 6)*



Yield: 86%; M.p. 125-127 °C; 1H NMR (400 MHz, CDCl3): 1.26 (6H, t, *J*=2.4 Hz, 2CH2CH3), 2.67 (4H, q, *J*=7.2 Hz, 2CH2CH3), 3.76 (3H, s, 2OCH3), 4.53 (2H, s, CH2-N),7.09 (2H, d, *J*=8.4 Hz, ArH), 7.17 (2H, d, *J*=8.4 Hz, ArH), 7.24 (2H, d, *J*=8.8 Hz, ArH),7.70 (2H, d, *J*=8.8 Hz, ArH), 8.05( 1H, s, NH) ppm.

*Ethyl4-(4-ethylphenylamino)-1-(4-ethylphenyl)-2,5-dihydro-5-oxo-1H-pyrrole-3-carboxylate (5g) (Table II, entry 7)*



Yield: 87%; M.p. 102-104 °C; 1H NMR (400 MHz, CDCl3): 1.24 (9H, m, 3 CH2CH3), 2.67 (4H, q, *J*=7.2 Hz, 2CH2CH3), 4.22 (2H, q, *J*=7.2 Hz, CH2CH3), 4.54 (2H, s, CH2-N), 7.09 (2H, d, *J*=8.4 Hz, ArH), 7.16 (2H, d, *J*=8.4 Hz, ArH), 7.24 (2H, d, *J*=8.4 Hz, ArH), 7.71 (2H, d, *J*=8.8 Hz, ArH), 8.01 (1H, s, NH) ppm.

*Ethyl 1-(4-bromophenyl)-3-(butylamino)-2,5-dihydro-2-oxo-1H-pyrrole-4-carboxylate (5k) (Table II, entry 11)*



Yield: 85%; M.p. 96-98 °C; 1H NMR (400 MHz, CDCl3): 0.97 (3H, t, *J* = 7.2 Hz, CH3), 1.35 (3H, t, *J* = 7.2 Hz, OCH2CH3), 1.43 (2H, sextet, *J* = 7.6 Hz, CH2), 1.61 (2H, quintet, *J* = 7.6 Hz, CH2), 3.87 (2H, t, *J* = 7.2 Hz, CH2-NH), 4.28 (2H, q, *J* = 7.2 Hz, OCH2CH3), 4.40 (2H, s, CH2-N), 6.72 (1H, br s, NH), 7.52 (2H, d, *J* = 8.8 Hz, ArH), 7.70 (2H, d, *J* = 8.8 Hz, ArH).

*Methyl4-(4-fluoroyphenylamino)-1-(4-fluorophenyl)-2,5-dihydro-5-oxo-1H-pyrrole-3-carboxylate (5l) (Table II, entry 12)*



Yield: 94%; M.p. 161-163 °C; 1H NMR (400 MHz, CDCl3):3.79 (3H, s, OCH3), 4.52 (2H, s, CH2-N), 7.04 (2H, t, *J*=8.4 Hz, ArH), 7.08-7.16 (4H, m, ArH), 7.73-7.76 (2H, m, ArH), 8.05 (1H, s, NH).

*Methyl4-(4-methoxyphenylamino)-1-(4-methoxyphenyl)-2,5-dihydro-5-oxo-1H-pyrrole-3-carboxylate (5o) (Table II, entry 15)*



Yield: 87%; M.p. 171-173 °C; 1H NMR (400 MHz, CDCl3): 3.77 (3H, s, CH3), 3.83 (6H, s, 2OCH3), 4.50 (2H, s, CH2-N), 6.89 (4H, d, *J*=17.6 Hz, ArH), 7.13 (1H, s, ArH) ,7.68 (1H, s, ArH), 8.03 (1H, s, NH).

*Ethyl4-(4-methoxyphenylamino)-1-(4-methoxyphenyl)-2,5-dihydro-5-oxo-1H-pyrrole-3-carboxylate (5p) (Table II, entry 16)*



Yield: 86%; M.p. 153-155 °C; 1H NMR (400 MHz, CDCl3): 1.26 (3H, t, *J*=7.2Hz, CH2CH3), 3.83 (6H, s, 2OCH3), 4.23 (2H, q, *J*=7.2 Hz, CH2CH3), 4.50 (2H, s, CH2-N), 6.87 (2H, d, *J*=8.8 Hz, ArH), 6.93 (2H, d, *J*=8.8 Hz, ArH), 7.12 (2H, d, *J*=8.8 Hz, ArH), 7.69 (2H, d, *J*=8.8 Hz, ArH), 8.02 (1H, s, NH).

*Methyl4-(4-methylphenylamino)-1-(4-methylphenyl)-2,5-dihydro-5-oxo-1H-pyrrole-3-carboxylate (5r) (Table II, entry 18)*



Yield: 90%; M.p. 175-176 °C; 1H NMR (400 MHz, CDCl3): 2.36 (6H, s, 2CH3), 3.77 (3H, s, OCH3), 4.52( 2H, s, CH2-N), 7.06 (2H, d, *J*=8.4 Hz, ArH), 7.14 (2H, d, *J*=8.4 Hz, ArH), 7.21(2H, d, *J*=8.4 Hz, ArH), 7.68 (2H, d, *J*=8.8 Hz, ArH), 8.03 (1H, s, NH).

*Ethyl4-(4-methylphenylamino)-1-(4-methylphenyl)-2,5-dihydro-5-oxo-1H-pyrrole-3-carboxylate (5s) (Table II, entry 19)*



Yield: 88%; M.p. 131-133 °C; 1H NMR (400 MHz, CDCl3): 1.25 (3H, t, *J*=7.2 Hz, CH2CH3), 2.37 (6H, s, 2CH3), 4.23 (2H, q, *J*=7.2 Hz, 2CH2CH3), 4.53 (2H, s, CH2-N),7.06 (2H, d, *J*=8.4 Hz, ArH), 7.14 (2H, d, *J*=8.4 Hz, ArH), 7.21 (2H, d, *J*=8.4 Hz, ArH), 7.68 (2H, d, *J*=8.4 Hz, ArH), 8.01 (1H, s, NH).

****

Fig. S-1*.*1H NMR Spectrum of compound (400 MHz, CDCl3) of **5f**

****

Fig. S-2*.*1H NMR Spectrum of compound (400 MHz, CDCl3) of **5g**



Fig. S-3*.*1H NMR Spectrum of compound (400 MHz, CDCl3) of **5k**

****

Fig. S-4*.*1H NMR Spectrum of compound (400 MHz, CDCl3) of **5l**

****

Fig. S-5*.*1H NMR Spectrum of compound (400 MHz, CDCl3) of **5o**

****

Fig. S-6*.*1H NMR Spectrum of compound (400 MHz, CDCl3) of **5p**

****

Fig. S-7*.*1H NMR Spectrum of compound (400 MHz, CDCl3) of **5r**

****

Fig. S-8*.*1H NMR Spectrum of compound (400 MHz, CDCl3) of **5s**