Supplementary Materials

Green one-pot multicomponent synthesis of fused-ring 2-Aminothiazoles

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Abstract: A facile, green and efficient Fe (III) chloride one-pot multicomponent reaction (MCR) for synthesis of 2-aminothiazole based compounds. Considering the medicinal importance of fused ring 2-aminothiazoles, the process reported here would provide an easier route to the synthesis of this class of compound. Detailed mechanism of the reaction has been discussed.

Keyword: 2-aminothiazole, iron(III) catalysed, MCR.

General Synthetic Procedure

The general reaction is presented in *Scheme 1*. A mixture of CS₂ (1.2mmol), 1.5mmol of the secondary amine, K₂CO₃ (3mmol) was stirred in 5ml DMSO at room temperature for 10 minutes. To this solution, FeCl₃ (1.5mmol) was added and continued to stir at room temperature for another 10 minutes. Then 1mmol of ortho-bromo amine or ortho iodo amine moiety was added to the solution. The mixture was then heated with stirring at 110°C for 6-8 hrs under nitrogen atmosphere. After completion of the reaction, the solution was allowed to cool to room temperature; 50ml water was added, extracted with ethyl acetate. The organic layer was collected and washed with water, brine and dried over Na₂SO₄. The solvent was removed to give the crude product and then purified by column chromatography over silica gel.

IR spectra of the compounds were taken in KBr pellet (cm⁻¹). ¹H NMR (400MHz) and ¹³C NMR (100MHz) spectra of all the synthesized compounds were taken as solution in CDCl₃, at 400 MHz (δ ppm) with TMS as internal standard.

2-(piperidin-1-yl)-7H-chromeno[6,5-d]thiazol-7-one (2a)

Colour: Greenish yellow

State: Solid

M.Pt: 141-143C

Yield: 70%

IR: 1540, 1617, 1722, 2862

¹H NMR: 1.73(s, 6H), 3.63(s, 4H), 6.48(d, J=9.2 Hz, 1H), 7.27(d, J=8.4 Hz, 1H), 7.65(d, J=8.8 Hz, 1H), 7.70(d, J=10.8 Hz, 1H)

¹³C NMR: 24.1, 25.3, 49.8, 112.6, 114.9, 121.9, 127.9, 140.9, 149.2, 149.9, 160.8, 168.2

2-(pyrrolidin-1-yl)-7H-chromeno[6,5-d]thiazol-7-one (2b)

Colour: Green

State: Solid

M.Pt: 255-257C

Yield: 74%

IR: 1550, 1622, 1713, 2875

¹H NMR: 2.12(s, 4H), 3.61(s, 4H), 6.49(d, J=9.6 Hz, 1H), 7.29(d, J=10 Hz, 1H), 7.71(2d, J=9.2 Hz, 2H)

¹³C NMR: 25.7, 49.8, 112.7, 115.1, 116.7, 121.8, 128.0, 141.0, 149.1, 150.3, 160.8, 164.7

2-(diisopropylamino)-7H-chromeno[6,5-d]thiazol-7-one (2c)

Colour: Brown

State: Solid

M.Pt: 144-146C

Yield: 63%

IR: 1546, 1619, 1730, 2873

¹H NMR: 1.46(s, 12H), 3.96-3.99(m, 2H), 6.47(d, J=9.6 Hz, 1H), 7.25(d, J=9.6 Hz, 1H), 7.63(d, J=8.4 Hz, 1H), 7.73(d, J=10 Hz, 1H)

¹³C NMR: 20.3, 51.4, 112.4, 114.6, 116.4, 121.8, 127.2, 141.4, 148.9, 150.3, 160.9, 164.9

2-(ethyl(phenyl)amino)-7H-chromeno[6,5-d]thiazol-7-one (2d)

Colour: Greenish yellow

State: Solid

M.Pt: 199-201C

Yield: 78%
IR: 1535, 1620, 1724, 2872
¹H NMR: 1.33(t, J=6.8Hz, 3H), 4.13(q, J=6.4Hz, 2H), 6.41(d, J=9.2Hz, 1H), 7.28(s, 1H),
7.41(d, J=6.4Hz, 2H), 7.46(d, J=7.6 Hz, 1H), 7.53(d, J=8.4Hz, 2H), 7.57(d, J=8.8 Hz, 1H), 7.72(d, J=9.2, Hz, 1H)
¹³C NMR: 13.1, 47.9, 112.4, 114.9, 116.5, 122.1, 127.9, 128.4, 128.5, 130.3, 140.9, 143.7, 149.5, 149.8, 160.7, 167.7

2-(ethyl (4-methoxyphenyl)amino)-7H-chromeno[6,5-d]thiazol-7-one (2e)

Colour: Greenish yellow
State: Solid
M.Pt: 191-193C
Yield: 71%
IR: 1533, 1608, 1716, 2856
¹H NMR: 1.29(t, J=7.6Hz, 3H), 3.88(s, 3H), 4.07(q, J=7.6Hz, 2H), 6.40(d, J=9.2Hz, 1H),
7.04(d, J=8.8Hz, 2H), 7.24-7.31(m, 3H), 7.56(d, J=9.2Hz, 1H), 7.69(d, J=8.8Hz, 1H)
¹³C NMR: 13.1, 47.8, 55.6, 112.5, 114.8, 115.5, 116.5, 122.0, 128.6, 129.6, 136.4, 140.9, 149.4, 150.0, 159.6, 160.7, 168.6

2-(diisopropylamino)-6-methylthiazolo[5,4-f]quinolin-7(6H)-one (3a)

Colour: Yellow
State: Solid
M.Pt: 154-156C
Yield: 69%
IR: 1545, 1614, 1662, 2884
¹H NMR: 1.46(s, 12H), 3.76(s, 3H), 3.99-4.02(m, 2H), 6.76(d, J=9.6Hz, 1H), 7.29(d, J=9.6Hz, 1H), 7.68(d, J=10 Hz, 1H), 7.71(d, J=9.2Hz, 1H)
¹³C NMR: 20.3, 29.9, 51.2, 112.3, 114.3, 121.3, 121.8, 128.2, 134.8, 136.1, 148.7, 161.8, 164.8

6-methyl-2-(piperidin-1-yl)thiazolo[5,4-f]quinolin-7(6H)-one (3b)

Colour: Greenish yellow
State: Solid
M.Pt: 166-168C
Yield: 72%

IR: 1538, 1612, 1648, 2855
¹H NMR: 1.73(s, 6H), 3.64(s, 4H), 3.77(s, 3H), 6.79(d, J=10Hz, 1H), 7.33(d, J=8.8Hz, 1H), 7.68(d, J=9.2Hz, 1H), 7.73(d, J=8.4 Hz, 1H)
¹³C NMR: 24.2, 25.3, 29.9, 49.8, 112.8, 114.5, 121.3, 122.0, 135.2, 135.9, 148.2, 161.7, 168.2

2-(ethyl(phenyl)amino)-6-methylthiazolo[5,4-f]quinolin-7(6H)-one (3c)

Colour: Yellow
State: Solid
M.Pt: 142-144C
Yield: 74%
IR: 1542, 1617, 1658, 2865
¹H NMR: 1.33(t, J=7.2 Hz, 3H), 3.75(s, 3H), 4.12(q, J=7.2Hz, 2H), 6.70(d, J=8.8Hz, 1H), 7.32(d, J=8.8Hz, 1H), 7.40-7.45(m, 3H), 7.49-7.54(m, 3H), 7.78(d, J=9.6H, 1H)
¹³C NMR: 13.1, 29.8, 47.8, 112.7, 114.3, 121.6, 121.9, 127.9, 128.3, 129.5, 130.3, 135.5, 135.8, 143.9, 148.2, 161.8, 167.5

6-ethyl-2-(piperidin-1-yl)thiazolo[5,4-f]quinolin-7(6H)-one (3d)

Colour: Yellow
State: Solid
M.Pt: 177-179C
Yield: 80%
IR: 1535, 1615, 1654, 2855
¹H NMR: 1.39(t, J=7.6 Hz, 3H), 1.73(s, 6H), 3.63(s, 4H), 4.41(q, J=7.2Hz, 2H), 6.77(d, J=9.6Hz, 1H), 7.35(d, J=8.8 Hz, 1H), 7.66(d, J=9.2 Hz, 1H), 7.73(d, J=9.2 Hz, 1H)
¹³C NMR: 12.9, 24.1, 25.3, 37.8, 49.8, 112.6, 114.7, 121.4, 122.1, 129.1, 134.1, 135.8, 148.1, 161.3, 168.2

6-ethyl-2-(pyrrolidin-1-yl)thiazolo[5,4-f]quinolin-7(6H)-one (3e)

Colour: Green
State: Solid
M.Pt: 232-234C
Yield: 75%
IR: 1542, 1617, 1662, 2855

¹H NMR: 1.39(t, J=7.2 Hz, 3H), 2.10-2.13(m, 4H), 3.61(t, J=6.4Hz, 4H), 4.42(q, J=7.2Hz, 2H), 6.78(d, J=9.6Hz, 1H), 7.36(d, J=9.2 Hz, 1H), 7.68(d, J=9.6Hz, 1H), 7.78(d, J=9.2Hz, 1H)
¹³C NMR: 12.9, 25.7, 37.5, 49.7, 114.9, 121.3, 122.1, 129.1, 133.9, 135.9, 148.5, 161.3, 164.5

2-(pyrrolidin-1-yl)-4H-chromeno[3,4-d]thiazol-4-one (4a)

Colour: Brown
State: Solid
M.Pt: 244-246C
Yield: 76%

IR: 1558, 1602, 1723, 2855

¹H NMR: 2.11(s, 4H), 3.61(s, 4H), 7.28(s, 1H), 7.37(s, 3H),

¹³C NMR: 25.8, 50.2, 116.8, 117.1, 123.5, 124.6, 128.5, 135.0, 137.9, 150.2, 156.0, 165.6

2-(1-phenylpropyl)-4H-chromeno[3,4-d]thiazol-4-one (4b)

Colour: Brown
State: Solid
M.Pt: 182-184C
Yield: 74%

IR: 1538, 1602, 1733, 2872

¹H NMR: 1.29(t, J=7.2 Hz, 3H), 4.19(q, J=7.6 Hz, 2H), 7.18-7.24(m, 2H), 7.37-7.41(m, 4H), 7.46(t, J=7.6Hz, 1H), 7.55(d, J=7.6 Hz, 2H)

¹³C NMR: 13.2, 47.9, 116.5, 117.2, 123.7, 124.6, 127.7, 128.8, 128.9, 130.7, 135.9, 137.3, 143.7, 150.6, 155.9, 169.0

S1: ^1H NMR spectrum of 2-(piperidin-1-yl)-7H-chromeno[6,5-d]thiazol-7-one

S2: ¹H NMR spectrum of 2-(pyrrolidin-1-yl)-7H-chromeno[6,5-d]thiazol-7-one

S3: ¹H NMR spectrum of 2-(diisopropylamino)-7H-chromeno[6,5-d]thiazol-7-one

S4: ¹H NMR spectrum of 2-(ethyl(phenyl)amino)-7H-chromeno[6,5-d]thiazol-7-one

S5: ¹H NMR spectrum of 2-(ethyl (4-methoxyphenyl)amino)-7H-chromeno[6,5-d]thiazol-7-one

S6:

S6: ¹H NMR spectrum of 2-(diisopropylamino)-6-methylthiazolo[5,4-f]quinolin-7(6H)-one

S7: ^1H NMR spectrum of 6-methyl-2-(piperidin-1-yl)thiazolo[5,4-f]quinolin-7(6H)-one

S8: ¹H NMR spectrum of 2-(ethyl(phenyl)amino)-6-methylthiazolo[5,4-f]quinolin-7(6H)-one

S9: ¹H NMR spectrum of 6-ethyl-2-(piperidin-1-yl)thiazolo[5,4-f]quinolin-7(6H)-one

S10: ¹H NMR spectrum of 6-ethyl-2-(pyrrolidin-1-yl)thiazolo[5,4-f]quinolin-7(6H)-one

S11: ¹H NMR spectrum of 2-(pyrrolidin-1-yl)-4H-chromeno[3,4-d]thiazol-4-one

S12: ¹H NMR spectrum of 2-(1-phenylpropyl)-4H-chromeno[3,4-d]thiazol-4-one

S13: ¹³C NMR spectrum of 2-(piperidin-1-yl)-7H-chromeno[6,5-d]thiazol-7-one

S14: ¹³C NMR spectrum of 2-(pyrrolidin-1-yl)-7H-chromeno[6,5-d]thiazol-7-one

S15: ¹³C NMR spectrum of 2-(diisopropylamino)-7H-chromeno[6,5-d]thiazol-7-one

S16: ¹³C NMR spectrum of 2-(ethyl(phenyl)amino)-7H-chromeno[6,5-d]thiazol-7-one

S17: ¹³C NMR spectrum of 2-(ethyl (4-methoxyphenyl)amino)-7H-chromeno[6,5-d]thiazol-7-one

S18: ¹³C NMR spectrum of 2-(diisopropylamino)-6-methylthiazolo[5,4-f]quinolin-7(6H)-one

S19: ^{13}C NMR spectrum of 6-methyl-2-(piperidin-1-yl)thiazolo[5,4-f]quinolin-7(6H)-one

S20: ¹³C NMR spectrum of 2-(ethyl(phenyl)amino)-6-methylthiazolo[5,4-f]quinolin-7(6H)-one

S21: ¹³C NMR spectrum of 6-ethyl-2-(piperidin-1-yl)thiazolo[5,4-f]quinolin-7(6H)-one

S22: ^{13}C NMR spectrum of 6-ethyl-2-(pyrrolidin-1-yl)thiazolo[5,4-f]quinolin-7(6H)-one

S23: ^{13}C NMR spectrum of 2-(pyrrolidin-1-yl)-4H-chromeno[3,4-d]thiazol-4-one

S24: ^{13}C NMR spectrum of 2-(1-phenylpropyl)-4H-chromeno[3,4-d]thiazol-4-one