Green and Efficient One-Pot Synthesis of 2-Amino-3-phenylsulphonyl-4*H*-chromenes under Solvent-Free Conditions

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ABSTRACT: *A green and convenient method for the synthesis of 2-amino-3-phenylsulphonyl-4H-chromenes by a one-pot three-component condensation of 1-naphthol, phenylsulphonylacetonitrile and aromatic aldehydes under solvent-free conditions using potassium phosphate tribasic trihydrate as an efficient catalyst is described. The reaction of 1-naphthol with phenylsulphonylacetonitrile and various aromatic aldehydes was carried out under solvent-free conditions at 100 °C using 10 mol% of potassium phosphate tribasic trihydrate as a catalyst. The results show that aromatic aldehydes containing electron-donating groups or electron-withdrawing groups could react smoothly to give the corresponding products in good to excellent yields. It was also found that potassium phosphate tribasic trihydrate can be recycled at least four times without loss of activity. High yields, short reaction times, ease of handling, cheap and reusable catalyst, mild and environmentally begin reaction conditions are the advantages of this procedure.*

KEYWORDS: *2-Amino-3-phenylsulphonyl-4H-chromene; Potassium phosphate tribasic trihydrate; Solvent-free; Multicomponent reactions.*

INTRODUCTION

2-Amino-4*H*-chromenes exhibit a wide spectrum of biological activities, such as antimicrobial [1], antiviral [2], mutagenicity [3], sex pheromone [4], antitumor [5] activities. In view of the great importance of 2-amino-4*H*-chromene derivatives, in recent years efforts have been made in developing new methodologies for the synthesis of these compounds by the condensation of 1-naphthol, malononitrile and aromatic aldehydes in the presence of a catalyst, such as diazabicyclo[2.2.2]octane [6], gel entrapped DABCO [7], piperidine [8], MCM-41-NH_2 [9], $TiCl_4$ [10], PEG-400 [11], iodine and K_2CO_3 [12], KF-Al_2O_3 [13-14], montmorillonite KSF [15], Mg/Al hydrotalcite [16], basic alumina [17], nanosized magnesium oxide [18], $NaHCO_3$ [19], potassium phthalimide [20], cetyltrimethylammonium bromide [21], hexadecyltrimethylammonium bromide [22], cetyltrimethylammonium chloride [23], N,N-dimethylaminoethylbenzyldimethylammonium chloride [24], methanesulfonic acid [25], and so on [26-30]. The discovery of a mild, efficient and recyclable catalyst with high catalytic activity, short reaction time, and the simple work-up procedure is still being actively pursued for the synthesis of new 2-amino-4*H*-chromene derivatives.

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Potassium phosphate is easily available, inexpensive, nontoxic and a mildly inorganic base. More recently, potassium phosphate has been reported as an efficient catalyst in several reactions [31-33]. Elimination of environmentally hazardous and toxic solvents is a frequent goal in green chemistry. Organic synthesis under solvent-free conditions is of great current interest [34-35]. To the best of our knowledge, potassium phosphate tribasic trihydrate catalyzed three-component condensation of 1-naphthol, phenylsulphonylacetonitrile and aromatic aldehydes have not been reported. In continuation of our interest in finding new environmentally benign methods for organic transformations [36], we now report a green and efficient method for the synthesis of 2-amino-3-phenylsulphonyl-4*H*-chromenes by the condensation of 1-naphthol, aromatic aldehydes and phenylsulphonylacetonitrile using potassium phosphate tribasic trihydrate as a reusable catalyst under solvent-free conditions (Scheme 1).

EXPERIMENTAL SECTION

Melting points were uncorrected. FT-IR spectra were obtained on a Nexus 470 spectrophotometer. NMR spectra were recorded on a Bruker Avance III 400 with TMS as an internal standard. Elemental analysis was performed using an Elementar Vario EL III elemental analyzer. Phenylsulphonylacetonitrile was prepared according to the literature method [37].

A typical procedure for the synthesis of 2-amino-3-phenylsulphonyl-4H-chromenes

1-Naphthol (2 mmol), benzaldehyde (2 mmol), phenylsulphonylacetonitrile (2 mmol) and potassium phosphate tribasic trihydrate (0.2 mmol) were added to a 50 mL round-bottom flask. Then, the mixture was stirred at 100 °C for the appropriate time (monitored by TLC). On completion of the reaction, the reaction mixture was cooled to room temperature. The solid crude product was recrystallized from ethanol (75%) to afford the pure product.

*2-Amino-3-phenylsulfonyl-4-phenyl-4H- benzo[h] chromene (**4a**)*

White solid; Mp 208-209 °C; IR (KBr),ν/cm^{-1}: 3415, 3328, 2406, 1653,1624, 1564, 1490,1445, 1369, 1262, 1190, 1136, 1063,1037, 810, 753; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.16 (d, *J* = 8.4 Hz, 1H), 7.72 (d, *J* = 8.0Hz, 1H), 7.58 (d, *J* = 8.0Hz, 2H), 7.53-7.42 (m, 3H), 7.33 (t, *J* =7.6 Hz, 1H), 7.25-7.19 (m, 2H), 7.10-6.97 (m, 6H), 6.01 (s, 2H), 5.02 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 157.2, 144.4, 143.4, 142.7, 133.0, 132.0, 128.5, 128.4, 127.9, 127.7, 126.6, 126.5, 126.2, 125.9, 124.5, 123.1, 120.7,120.3,120.2,85.8, 41.9. Anal. calcd for $C_{25}H_{19}NO_3S$: C 72.62, H 4.63, N 3.39; found: C 72.89, H 4.69, N 3.31.

*2-Amino-3-phenylsulfonyl-4-(4-methylphenyl)-4H-benzo[h] chromene (**4b**).*

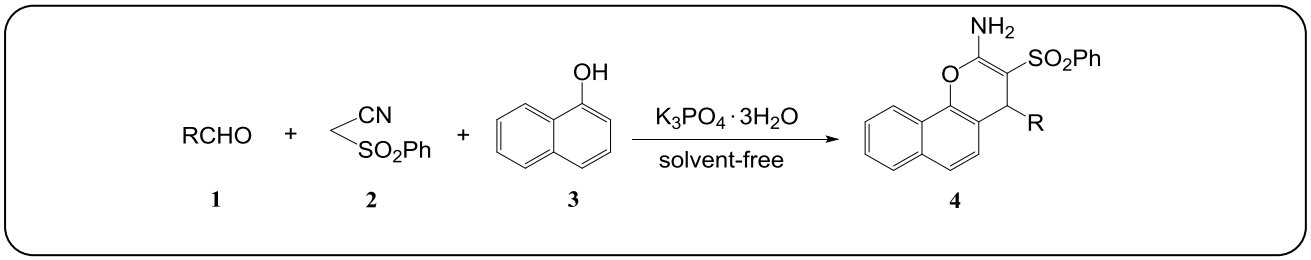
White solid; Mp 202-203 °C; IR (KBr),ν/cm^{-1}: 3428, 3328, 2344, 1649, 1563, 1393, 1261, 1185, 1139, 1089, 1017, 812, 763; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.15 (d, *J* = 8.4 Hz, 1H), 7.71 (d, *J* =8.4 Hz, 1H), 7.58 (d, *J* =7.6 Hz, 2H), 7.51-7.41 (m, 3H), 7.34 (t, *J* =7.2 Hz, 1H), 7.24-7.18 (m, 2H), 7.05 (d, *J* = 8.8 Hz, 1H), 6.98 (d, *J* = 8.0 Hz, 2H), 6.80 (d, *J* = 8.0 Hz, 2H), 6.01 (s, 2H), 4.96 (s, 1H), 2.16 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 157.1, 143.5, 142.5, 141.6, 136.1, 132.9, 131.8, 129.0, 128.4, 128.3, 127.9, 127.7, 126.5, 126.4, 126.2, 126.0, 124.5, 123.1, 120.7, 120.3, 85.9, 41.4, 20.9. Anal. calcd for $C_{26}H_{21}NO_3S$: C 73.05, H 4.95, N 3.28; found: C 73.29, H 4.86, N 3.21.

2-Amino-3-phenylsulfonyl-4-(3-methoxyphenyl)-4H-benzo[h] chromene (4c).

White solid; Mp 232-234 °C; IR (KBr),ν/cm^{-1}: 3427, 3324, 1649, 1622, 1562, 1485, 1443, 1395, 1374, 1280, 1260, 1190, 1143, 1089, 1047, 1016, 816, 756; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.14 (d, *J* = 8.0 Hz, 1H), 7.72 (d, *J* = 8.0 Hz, 1H), 7.60 (d, *J* = 7.6 Hz, 2H), 7.52-7.42 (m, 3H), 7.34 (t, *J* = 7.6 Hz, 1H), 7.25-7.20 (m, 2H), 7.07 (d, *J* = 8.4 Hz, 1H), 6.95 (t, *J* = 8.0 Hz, 1H), 6.77 (d, *J* = 8.0 Hz, 1H), 6.56 (s, 1H), 6.51 (d, *J* = 8.0 Hz, 1H), 6.03 (s, 2H), 5.00 (s, 1H), 3.59 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 159.5, 157.1, 145.8, 143.5, 142.6, 133.0, 131.9, 129.3, 128.3, 128.3, 127.7, 126.5, 126.4 126.2, 125.8, 124.5, 123.1, 120.7, 120.5, 120.0, 113.8, 111.9, 85.7, 55.0, 41.9. Anal. calcd for $C_{26}H_{21}NO_4S$: C 70.41, H 4.77, N 3.16; found: C 70.67, H 4.83, N 3.06.

*2-Amino-3-phenylsulfonyl-4-(4-methoxyphenyl)-4H-benzo[h] chromene (**4d**).*

White solid; Mp 163-164 °C; IR (KBr),ν/cm^{-1}: 3439, 3335, 2345, 1654, 1628, 1571, 1461, 1445, 1369, 1285, 1256, 1229, 1173, 1137, 1091, 1026, 808, 741; ^{1}H NMR



Scheme 1: Synthesis of 2-amino-3-phenylsulphonyl-4H-chromenes.

(400 MHz, $CDCl_3$)δ: 8.15 (d, *J* = 8.4 Hz, 1H), 7.72 (d, *J* = 8.0 Hz, 1H), 7.58 (d, *J* = 7.2 Hz, 2H), 7.52-7.42 (m, 3H), 7.35 (t, *J* = 7.2 Hz, 1H), 7.25-7.21 (m, 2H), 7.04 (d, *J* = 8.4, 1H),6.99 (d, *J* = 8.0, 2H), 6.53 (d, *J* = 8.8 Hz, 2H), 6.01 (s, 2H), 4.98 (s, 1H), 3.67 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 158.2, 157.0, 143.6, 142.5, 136.7, 132.9, 131.9, 129.0, 128.4, 127.7, 126.5, 126.4, 126.2, 126.0, 124.5, 123.1, 120.7, 120.3, 113.7, 100.0, 85.9, 55.2, 41.0. Anal. calcd for $C_{26}H_{21}NO_4S$: C 70.41, H 4.77, N 3.16; found: C 70.59, H 4.71, N 3.11.

*2-Amino-3-phenylsulfonyl-4-(4-fluorophenyl) -4H-benzo[h] chromene (**4e**).*

White solid; Mp 246-248 °C; IR (KBr),*v*/cm^{-1}: 3470, 3339, 2341, 1651, 1625, 1565, 1502, 1446, 1392, 1371, 1282, 1260, 1214, 1186, 1131, 1091, 1058, 851, 763; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.16 (d, *J* = 8.4 Hz, 1H), 7.74 (d, *J* = 8.4 Hz, 1H), 7.60-7.44 (m, 5H), 7.38 (t, *J* = 7.6 Hz, 1H), 7.27-7.23 (m, 2H), 7.06- 7.01 (m, 3H), 6.68 (t, *J* = 8.4 Hz, 2H), 6.03 (s, 2H), 5.03 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 157.1, 143.4, 142.5, 140.1, 132.9, 132.0, 129.6, 129.5, 128.4, 127.7, 126.6, 126.1, 125.8, 124.6, 123.4, 123.1 , 120.6, 119.9, 115.1, 114.9, 86.0, 41.1. Anal. calcd for $C_{25}H_{18}FNO_3S$: C 69.59, H 4.21, N 3.25; found: C 69.31, H 4.27, N 3.32.

*2-Amino-3-phenylsulfonyl-4-(2-chlorophenyl)-4H-benzo[h] chromene (**4f**).*

White solid; Mp 202-204 °C; IR (KBr),*v*/cm^{-1}: 3445, 3310, 2345, 1651, 1624, 1563, 1444, 1371, 1281, 1261, 1192, 1163, 1093, 1034, 748; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.16 (d, *J* = 8.1 Hz, 1H), 7.71 (t, *J* = 7.6 Hz, 3H), 7.54-7.41 (m, 3H), 7.35 (t, *J* = 7.6 Hz, 1H), 7.27-7.09 (m, 5H), 6.91 (dd, *J* = 5.6, 3.6 Hz, 2H), 6.11 (s, 2H), 5.62 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 157.5, 142.9, 142.8, 142.6, 133.1, 133.1, 132.2, 130.8, 129.5, 128.5, 128.5, 127.9, 127.7, 127.1, 126.5, 126.5, 126.3, 125.3, 124.5, 123.0, 120.8, 84.5, 38.0. Anal. calcd for $C_{25}H_{18}ClNO_3S$: C 67.04, H 4.05, N 3.13; found: C 67.29, H 4.12, N 3.06.

*2-Amino-3-phenylsulfonyl-4-(4-chlorophenyl)-4H-benzo[h] chromene (**4g**).*

White solid; Mp 227-229 °C; IR (KBr),*v*/cm^{-1}: 3466, 3340, 2345, 1651, 1625, 1565, 1487, 1445, 1391, 1369, 1261, 1185, 1131, 1088, 1059, 846, 809, 760; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.15 (d, *J* = 8.4 Hz, 1H), 7.73 (d, *J* = 8.0 Hz, 1H), 7.59-7.37 (m, 6H), 7.24 (t, *J* = 8.0 Hz, 2H), 7.00 (dd, *J* = 8.4, 5.6 Hz, 3H), 6.95 (d, *J* = 7.6 Hz, 2H), 6.06 (s, 2H), 5.00 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 157.1, 143.4, 143.0, 142.6, 133.0, 132.4, 132.1, 129.4, 128.5, 128.4, 127.7, 126.6, 126.1, 125.7, 124.7, 123.1, 120.7, 119.5, 85.5, 41.3. Anal. calcd for $C_{25}H_{18}ClNO_3S$: C 67.04, H 4.05, N 3.13; found: C 67.33, H 4.09, N 3.05.

*2-Amino-3-phenylsulfonyl-4-(4-bromophenyl)-4H-benzo[h] chromene (**4h**).*

White solid; Mp 204-205 °C; IR (KBr),*v*/cm^{-1}: 3485, 3371, 2341, 1652, 1624, 1551, 1480, 1445, 1369, 1282, 1188, 1135, 1092, 1060, 1007, 849, 801, 759; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.15 (d, *J* = 8.0 Hz, 1H), 7.73 (d, *J* = 7.6 Hz, 1H), 7.59-7.40 (m, 6H), 7.27-7.23 (m, 2H), 7.10 (d, *J* = 8.4 Hz, 2H), 7.01-6.94 (m, 3H), 6.05 (s, 2H), 4.99 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 157.1, 143.5, 143.4, 142.6, 133.1, 132.0, 131.3, 129.8, 128.5, 128.5, 127.7, 126.6, 126.6, 126.1, 125.7, 124.7, 123.1, 120.7, 120.6, 119.4, 85.5, 41.4. Anal. calcd for $C_{25}H_{18}BrNO_3S$: C 60.98, H 3.68, N 2.84; found: C 60.72, H 3.61, N 2.89.

*2-Amino-3-phenylsulfonyl-4-(2-nitrophenyl)-4H-benzo[h] chromene (**4i**).*

Green solid; Mp 242-243 °C; IR (KBr),*v*/cm^{-1}: 3450, 3346, 2344, 1652, 1624, 1524, 1444, 1368, 1282, 1261, 1191, 1134, 1094, 1060, 854, 832; ^{1}H NMR (400 MHz, $CDCl_3$) δ: *8.19* (d, *J* = 8.0 Hz, 1H), 7.76-7.73 (m, 4H), 7.56-7.34

(m, 7H), 7.26-7.25 (m, 2H), 7.17 (t, *J* = 4.0 Hz,1H), 6.08 (s, 2H), 5.88 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 157.2, 148.6, 143.2, 142.7, 140.5, 133.3, 133.0, 132.5, 131.7, 128.9, 128.9, 127.7, 127.3, 126.8, 126.7, 126.2, 125.7, 124.9, 123.8, 123.1, 120.7, 119.1, 86.0, 34.8. Anal. calcd for $C_{25}H_{18}N_2O_5S$: C 65.49, H 3.96, N 6.11; found: C 65.74, H 3.91, N 6.23.

*2-Amino-3-phenylsulfonyl-4-(3-nitrophenyl)-4H-benzo[h] chromene (**4j**).*

White solid; Mp 261-262 °C; IR (KBr),*ν*/cm^{-1}: 3410, 3301, 2344, 1650, 1622, 1563, 1526, 1446, 1375, 1350, 1276, 1187, 1139, 1093, 1063, 950, 897, 825; ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.32 (d, *J* = 8.8 Hz, 1H), 7.96 (s, 1H), 7.91 (d, *J* = 7.2 Hz, 1H), 7.84 (d, *J* = 8.0 Hz, 1H), 7.72 (d, *J* = 7.2 Hz, 3H), 7.64-7.54 (m, 5H), 7.46-7.34 (m, 5H), 5.31 (s, 1H); ^{13}C NMR (100 MHz, DMSO-d_6) δ: 158.9, 148.1, 148.1, 144.1, 143.1, 134.5, 133.1, 132.6, 130.4, 129.2, 128.1, 127.3, 127.2, 126.0, 124.8, 123.1, 122.1, 121.8, 121.3, 120.3, 82.1, 40.9. Anal. calcd for $C_{25}H_{18}N_2O_5S$: C 65.49, H 3.96, N 6.11; found: C 65.23, H 3.89, N 6.19.

*2-Amino-3-phenylsulfonyl-4-(4-nitrophenyl)-4H-benzo[h] chromene (**4k**).*

White solid; Mp 214-216 °C; IR (KBr),*ν*/cm^{-1}: 3463, 3336, 2293, 1651, 1627, 1515, 1444, 1392, 1349, 1262, 1184, 1131, 1090, 1015, 859, 826; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.17 (d, *J* = 8.4 Hz, 1H), 7.87 (d, *J* = 8.4 Hz, 2H), 7.74 (d, *J* = 8.0 Hz, 1H), 7.65 (d, *J* = 7.6 Hz, 2H), 7.58-7.45 (m, 3H), 7.38 (t, *J* = 7.6 Hz, 1H), 7.28-7.23 (m, 4H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.17 (s, 2H), 5.09 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 157.1, 143.4, 142.5, 140.3, 132.9, 132.0, 129.5, 129.5, 128.4, 127.7, 126.6, 126.6, 126.1, 125.8, 124.6, 123.1, 120.6, 119.9, 115.1, 114.9, 86.0, 41.1. Anal. calcd for $C_{25}H_{18}N_2O_5S$: C 65.49, H 3.96, N 6.11; found: C 65.21, H 3.89, N 6.20.

RESULTS AND DISCUSSION

To optimize the reaction conditions, condensation of 1-naphthol, phenylsulphonylacetonitrile and benzaldehyde were selected as a model reaction. The effect of temperature was investigated by carrying out the model reaction using 10 mol% of catalyst at various temperatures under solvent-free conditions. It was observed that the yield increased as the reaction temperature was raised to 100 °C. Higher temperatures did not increase the yield. Therefore, 100 °C was selected as the optimum temperature under solvent-free conditions.

Next, the various concentrations of catalyst were employed and the reaction was carried out at 100°C. The efficiency of the reaction was obviously affected by the amount of the catalyst. No product could be detected even after 30 min in the absence of the catalyst. As the catalyst concentration increases from 5 mol% to 10 mol%, there is an increase in the product yield. It was found that 10 mol% of the catalyst was sufficient to push the reaction forward. A higher percentage of catalyst loading neither increases the yield nor lowers the reaction time (Table 1).

To explore the generality of the reaction, we extended our study using potassium phosphate tribasic trihydrate (10 mol%) as catalyst under the solvent-free condition at 100 ºC with different aromatic aldehydes to synthesis a series of 2-amino-3-phenylsulphonyl-4*H*-chromenes. The desired products were characterized by IR, ^{1}H, and ^{13}C NMR spectroscopies. For example, IR spectra of the product **4a** showed the presence of two bands due to the sulfone group, 1136 and 1369 cm^{-1}, two bands due to the amino group at 3,328 and 3,415 cm^{-1}. It exhibited a singlet in ^{1}H NMR spectra at δ 5.02 for H-4 and also a distinguishing peak at δ 41.9 for C-4 in the ^{13}C NMR spectra. As can be seen from Table 2, in all cases, aromatic aldehydes with substituents carrying either electron-withdrawing or electron-donating groups reacted successfully and gave the products in high yields. It was shown that the aromatic aldehydes with electron-withdrawing groups reacted faster than the aromatic aldehydes with the electron-donating group. Sterically hindered aromatic aldehydes required longer reaction times (Table 2, entry 6).

From the perspective of green chemistry, efficient recovery and reuse of the catalyst are highly desirable. Therefore, the recovery and reusability of potassium phosphate tribasic trihydrate were investigated. We chose the reaction of 1-naphthol, phenylsulphonylacetonitrile, and benzaldehyde as a model. When the first run of the reaction was completed, the solid product was recrystallized from ethanol (75%) to obtain the pure product. The mother liquor was then evaporated under reduced pressure. The catalyst was recovered, washed with dichloromethane 3 times, dried, and reused for consecutive runs under the same reaction conditions without any loss of catalytic activity at least up to 5th run (Table 3).

Table 1: Screening of reaction conditions for the condensation of 1-naphthol, phenylsulphonylacetonitrile and benzaldehyde using $K_3PO_4{\cdot}3H_2O$ as a catalyst. [a]

Entry	Catalyst loading (mol%)	Temperature (ºC)	Time (min)	Yield (%)
1	10	90	5	88
2	10	100	5	92
3	10	110	5	92
4	10	120	5	92
5	0	100	30	0
6	5	100	5	81
7	15	100	5	91

[a] *Reaction conditions: benzaldehyde (2 mmol), 1-naphthol (2 mmol), phenylsulphonylacetonitrile (2 mmol), solvent-free.*

Table 2: Synthesis of 2-amino-3-phenylsulphonyl-4H-chromenes. [a]

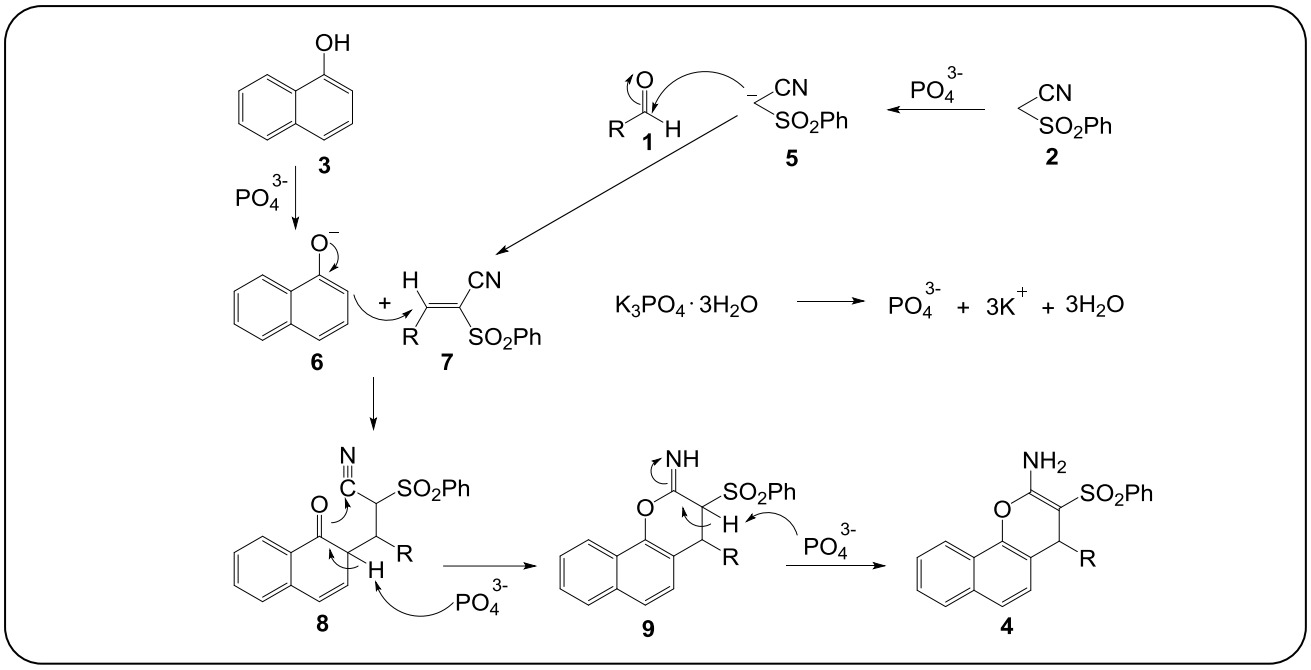
Entry	R	Product	Time (min)	Yield (%)
1	C_6H_5	4a	5	92
2	4-$CH_3C_6H_4$	4b	10	91
3	3-$CH_3OC_6H_4$	4c	10	89
4	4-$CH_3OC_6H_4$	4d	15	86
5	4-FC_6H_4	4e	5	91
6	2-ClC_6H_4	4f	40	85
7	4-ClC_6H_4	4g	5	91
8	4-BrC_6H_4	4h	5	92
9	2-$NO_2C_6H_4$	4i	5	93
10	3-$NO_2C_6H_4$	4j	5	92
11	4-$NO_2C_6H_4$	4k	5	93

[a] *Reaction conditions: aldehyde (2 mmol), 1-naphthol (2 mmol), phenylsulphonylacetonitrile (2 mmol), potassium phosphate tribasic trihydrate (0.2 mmol), 100 ºC, solvent-free.*

Table 3: Recycling of potassium phosphate tribasic trihydrate. [a]

Run	Time (min)	Isolated yield (%)
1	5	92
2	5	90
3	5	89
4	5	89
5	5	89

[a] *Reaction conditions: benzaldehyde (2 mmol), 1-naphthol (2 mmol), phenylsulphonylacetonitrile (2 mmol), potassium phosphate tribasic trihydrate (0.2 mmol), 100 ºC, solvent-free.*



Scheme 2: A proposed mechanism for potassium phosphate tribasic trihydrate catalyzed the synthesis of 2-amino-3-phenylsulphonyl-4H-chromenes.

On the basis of the literature [32], a proposed mechanism for the reaction is described in Scheme 2. Knoevenagal condensation between aldehyde **1** and phenylsulphonylacetonitrile **2** produced arylmethylidene phenylsulphonylacetonitrile **7**. Michael addition of **6** with **7**, followed by cyclization and tautomerization afforded the corresponding product **4**.

CONCLUSIONS

In conclusion, we have developed a green and efficient method for the synthesis of 2-amino-3-phenylsulphonyl-4*H*-chromenes by the condensation of phenylsulphonylacetonitrile, 1-naphthol and aromatic aldehydes under solvent-free conditions using potassium phosphate tribasic trihydrate as a catalyst. High yields, short reaction times, ease of handling, cheap and reusable catalyst, mild and environmentally begin reaction conditions are the advantages of this procedure.

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