# **Electronic Supplementary Information**

## DABCO Catalyzed Cross-Rauhut-Currier/ Transesterification Reaction of Activated Alkenes with Phenyl Acrylates: The Scope and Mechanistic Insight.

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**General Information:** Unless otherwise indicated, all compounds and reagents were purchased from commercial suppliers and used without further purification. Proton nuclear magnetic resonance spectra are recorded at 400 MHz. All chemical shifts (d) are given in ppm. NMR spectra were recorded on Bruker AMX-400 NMR spectrometer. IR spectra were recorded on a Perkin-Elmer 983G instrument. HRMS was recorded on a HP-5989A spectrometer. ESI-MS was recorded on an Agilent-6110 spectrometer. LC was recorded on an Agilent-1200 series system. The substrates **2a-2o** were prepared as reported before (W. Liu, *Tetrahedron*, **2011**, *67*, 1768–1773).

#### General procedure for the Tandem Cross-Rauhut-Currier/transesterification

Reactions



Scheme 1.

To a mixture of enone 2 (0.10 mmol) and acrylic acid ester 3a (0.30 mmol) in acetonitrile (1.0 mL) was added DABCO (0.01 mmol) at ambient temperature. After stirring for 2-3.5 h, the solvent was concentrated to afford the desired product 1 after flash column chromatography on silica gel (PE/ EA 95 : 5).



**5-Methyl-6-oxo-2,4-diphenyl-6H-pyran-3-carbonitrile** (1a): white solid; Mp: 133-134 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  2.01 (3H, s),  $\delta$  7.31- 7.33 (2H, m),  $\delta$  7.51- 7.58 (6H, m),  $\delta$  8.03- 8.05 (2H, m); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  14.4, 93.4, 115.3, 115.5, 121.5, 127.9, 128.5, 129.0, 129.7, 129.9, 132.6, 134.3, 151.0, 160.8, 165.8; IR (KBr): 2958, 2918, 2849, 2227, 1736, 1620, 1543, 1494, 1446, 1344, 1160, 848 cm<sup>-1</sup>; HRMS (ESI) Calcd for C<sub>19</sub>H<sub>13</sub>NNaO<sub>2</sub> ([M+Na]<sup>+</sup>) 310.0839. Found: 310.0852.



**4-(4-Bromo-phenyl)-5-methyl-6-oxo-2-phenyl-6H-pyran-3-carbonitrile** (1b): white solid; Mp: 166-167 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  2.00 (3H, s),  $\delta$  7.21 (2H, d, J = 8.4 Hz),  $\delta$  7.51- 7.61 (3H, m),  $\delta$  7.68 (2H, d, J = 8.4 Hz),  $\delta$  8.03 (2H, d, J = 7.2 Hz); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  14.4, 92.9, 115.4, 121.7, 124.3, 128.5, 129.0, 129.6, 129.8, 132.4, 132.7, 133.1, 149.7, 160.4, 165.9; IR (KBr): 2958, 2923, 2851, 2227, 1740, 1489, 1187, 1081, 967 cm<sup>-1</sup>; HRMS (ESI) Calcd for C<sub>19</sub>H<sub>12</sub>BrNNaO<sub>2</sub> ([M+Na]<sup>+</sup>) 387.9944. Found: 387.9929.



**4-(3-Bromo-phenyl)-5-methyl-6-oxo-2-phenyl-6H-pyran-3-carbonitrile** (1c): white solid; Mp: 164-165 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  2.01(3H, s),  $\delta$  7.27 (1H, d, J = 6.8 Hz),  $\delta$  7.42 (1H, t, J = 8.0 Hz),  $\delta$  7.47 (1H, s),  $\delta$  7.52-7.66 (4H, m),  $\delta$  8.04 (2H, d, J = 7.2 Hz); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  14.5, 92.9, 115.2, 121.9, 123.1, 124.5, 126.6, 128.5, 129.0, 129.8, 130.7, 130.8, 132.8, 132.9, 136.2, 149.3, 160.3, 165.9; IR (KBr): 2961, 2922, 2851, 2227, 1737, 1620, 1577, 1494, 1344, 1161, 1076, 988, 857 cm<sup>-1</sup>; HRMS (ESI) Calcd for C<sub>19</sub>H<sub>12</sub>BrNNaO<sub>2</sub> ([M+Na]<sup>+</sup>) 387.9944. Found: 387.9938



4-(2-Bromo-phenyl)-5-methyl-6-oxo-2-phenyl-6H-pyran-3-carbonitrile (1d):

white solid; Mp: 160-161 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  1.93 (3H, s),  $\delta$  7.24 (1H, d, *J* = 1.2 Hz),  $\delta$  7.35-7.40 (1H, m),  $\delta$  7.47-7.56 (4H, m),  $\delta$  7.75 (1H, d, *J* = 8.0 Hz)  $\delta$  8.06-8.08 (2H, m); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  14.1, 93.1, 114.9, 121.7, 122.5, 128.2, 128.4, 129.0, 129.1, 129.8, 131.2, 132.7, 133.4, 135.5, 150.1, 160.6, 165.6; IR (KBr): 2960, 2918, 2849, 2227, 1740, 1623, 1544, 1507, 1447, 1343, 1162, 1028, 1007, 987, 848 cm<sup>-1</sup>; HRMS (ESI) Calcd for C<sub>19</sub>H<sub>12</sub>BrNNaO<sub>2</sub> ([M+Na]<sup>+</sup>) 387.9944. Found: 387.9945



**4-(4-Chloro-phenyl)-5-methyl-6-oxo-2-phenyl-6H-pyran-3-carbonitrile** (1e): white solid; Mp: 148-149 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  2.00(3H, s),  $\delta$  7.27 (2H, d, J = 8.4 Hz),  $\delta$  7.51- 7.59 (5H, m),  $\delta$  8.02-8.04 (2H, m); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  14.4, 93.0, 115.4, 121.7, 128.5, 129.0, 129.4, 129.8, 132.6, 132.7, 136.1, 149.8, 160.4, 165.9; IR (KBr): 2959, 2918, 2850, 2227, 1738, 1621, 1541, 1491, 1447, 1091, 967, 853 cm<sup>-1</sup>; HRMS (ESI) Calcd for C<sub>19</sub>H<sub>12</sub>ClNNaO<sub>2</sub> ([M+Na]<sup>+</sup>) 344.0449. Found: 344.0456



**4-(4-Fluoro-phenyl)-5-methyl-6-oxo-2-phenyl-6H-pyran-3-carbonitrile (1f):** white solid; Mp: 107-108 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  2.01(3H, s),  $\delta$  7.23 (2H, t, J = 8.4 Hz),  $\delta$  7.31- 7.34 (2H, m),  $\delta$  7.52- 7.59 (3H, m),  $\delta$  8.04 (2H, d, J = 7.6 Hz); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  14.4, 93.3, 115.5, 116.3 (J = 22.0 Hz), 121.8, 128.7 (J = 56.6 Hz), 129.8, 130.0, 130.1, 130.4 (J = 3.7 Hz), 132.7, 150.0, 160.5, 163.4 (J = 249.3 Hz), 165.8; IR (KBr): 2960, 2918, 2849, 2227, 1735, 1635, 1541, 1509, 1495, 1344, 1233, 1161, 1080, 967, 857, 845 cm<sup>-1</sup>; HRMS (ESI) Calcd for C<sub>19</sub>H<sub>12</sub>FNNaO<sub>2</sub> ([M+Na]<sup>+</sup>) 328.0744. Found: 328.0741



**4-(4-Methoxy-phenyl)-5-methyl-6-oxo-2-phenyl-6H-pyran-3-carbonitrile** (1g): white solid; Mp: 120-121  $^{\circ}$ C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  2.03(3H, s),  $\delta$  3.87(3H,

s),  $\delta$  7.04 (2H, d, J = 9.2 Hz),  $\delta$  7.26- 7.28 (2H, m), $\delta$  7.51- 7.58 (3H, m),  $\delta$  8.03 (2H, d, J = 7.2 Hz); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  14.5, 55.4, 93.8, 114.4, 115.8, 121.3, 126.4, 128.5, 129.0, 129.6, 130.0, 132.5, 150.8, 160.6, 160.8, 165.6; IR (KBr): 2957, 2924, 2852, 2227, 1733, 1609, 1540, 1511, 1446, 1343, 1292, 1252, 1177, 1160, 1029, 853, 838 cm<sup>-1</sup>; HRMS (ESI) Calcd for C<sub>20</sub>H<sub>15</sub>NNaO<sub>3</sub> ([M+Na]<sup>+</sup>) 340.0944. Found: 340.0950



**4-(2,4-Dichloro-phenyl)-5-methyl-6-oxo-2-phenyl-6H-pyran-3-carbonitrile** (**1h**): white solid; Mp: 134-135 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  1.94(3H, s),  $\delta$  7.21 (1H, d, J = 8.4 Hz),  $\delta$  7.44 (1H, dd, <sup>3</sup>J = 8.4 Hz, <sup>4</sup>J = 2.0 Hz),  $\delta$  7.52- 7.60 (4H, m),  $\delta$  8.05 (2H, d, J = 7.2 Hz); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  14.2, 92.7, 114.6, 123.0, 128.1, 128.4, 129.1, 129.7, 130.1, 130.3, 131.8, 132.8, 133.2, 136.7, 147.5, 160.1, 165.8; IR (KBr): 2960, 2919, 2850, 2227, 1742, 1624, 1545, 1494, 1473, 1344, 1187, 1162, 1103, 1065, 1008, 968 cm<sup>-1</sup>; HRMS (ESI) Calcd for C<sub>19</sub>H<sub>10</sub>Cl<sub>2</sub>NO<sub>2</sub> ([M-H]<sup>+</sup>) 354.0094. Found: 354.0084



**4-Furan-2-yl-5-methyl-6-oxo-2-phenyl-6H-pyran-3-carbonitrile** (**1i**): white solid; Mp: 122-123 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  2.28(3H, s),  $\delta$  6.63 (1H, t, *J* = 1.6 Hz),  $\delta$  6.99 (1H, d, *J* = 3.2 Hz),  $\delta$  7.52- 7.59 (3H, m),  $\delta$  7.69 (1H, s),  $\delta$  8.00 (2H, d, *J* = 7.6 Hz); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  14.8, 91.2, 112.0, 115.8, 116.0, 120.8, 128.7, 128.9, 130.0, 132.6, 138.2, 144.9, 145.9, 160.8, 166.7; IR (KBr): 2959, 2918, 2849, 2226, 1734, 1609, 1541, 1490, 1458, 1446, 1341, 1209, 1081, 966 cm<sup>-1</sup>; HRMS (ESI) Calcd for C<sub>17</sub>H<sub>11</sub>NNaO<sub>3</sub> ([M+Na]<sup>+</sup>) 300.0631. Found: 300.0637



**5-Methyl-6-oxo-2-phenyl-4-thiophen-2-yl-6H-pyran-3-carbonitrile** (1j): white solid; Mp: 147-148 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  2.15(3H, s),  $\delta$  7.19-7.22 (2H, m),  $\delta$  7.51- 7.58 (4H, m),  $\delta$  8.03 (2H, d, J = 7.2 Hz); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  14.9, 93.9, 115.4, 123.5, 127.7, 128.6, 128.6, 129.0, 129.5, 129.9, 132.7, 133.5, 144.2, 160.3, 165.7; IR (KBr): 2959, 2918, 2850, 2226, 1735, 1611, 1492, 1446, 1343, 1187,

1079.4, 1039, 968 cm<sup>-1</sup>; HRMS (ESI) Calcd for  $C_{17}H_{11}NNaO_2S$  ([M+Na]<sup>+</sup>) 316.0403. Found: 316.0410



**5-Methyl-4-(4-nitro-phenyl)-6-oxo-2-phenyl-6H-pyran-3-carbonitrile (1k):** white solid; Mp: 155-156 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  2.00 (3H, s),  $\delta$  7.53-7.64 (5H, m),  $\delta$  8.05 (2H, d, J = 7.6 Hz),  $\delta$  8.42 (2H, d, J = 8.8 Hz); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  14.5, 92.2, 115.1, 122.0, 124.4, 128.4, 129.1, 129.3, 129.6, 133.0, 140.5, 148.6, 148.6, 159.9, 166.3; IR (KBr): 2957, 2924, 2854, 2227, 1738, 1651, 1599, 1521, 1494, 1488, 1446, 1348, 1255, 1242, 1038, 967, 867 cm<sup>-1</sup>; HRMS (ESI) Calcd for C<sub>19</sub>H<sub>11</sub>N<sub>2</sub>O<sub>4</sub> ([M-H]<sup>+</sup>) 331.0724. Found: 331.0730



**5-Methyl-4-(1-methyl-1H-indol-3-yl)-6-oxo-2-phenyl-6H-pyran-3-carbonitrile** (**1**): white solid; Mp: 143-144 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  2.09(3H, s), 3.90(3H, s),  $\delta$  7.22-7.25 (1H, m),  $\delta$  7.31-7.43 (4H, m),  $\delta$  7.50-7.57 (3H, m),  $\delta$  8.04 (2H, d, J = 7.2 Hz); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  15.4, 33.4, 94.7, 108.6, 110.2, 116.4, 120.1, 120.8, 121.1, 122.7, 126.1, 128.6, 128.9, 129.6, 130.3, 132.4, 136.8, 144.6, 161.0, 165.7; IR (KBr): 2957, 2924, 2225, 1729, 1614, 1542, 1491, 1473, 1446, 1375, 1342, 1244, 1173, 1080, 1028, 989, 848 cm<sup>-1</sup>; HRMS (ESI) Calcd for C<sub>22</sub>H<sub>16</sub>N<sub>2</sub>NaO<sub>2</sub> ([M+Na]<sup>+</sup>) 363.1104. Found: 363.1103



**2-(4-Bromo-phenyl)-5-methyl-6-oxo-4-phenyl-6H-pyran-3-carbonitrile** (1m): white solid; Mp: 167-168 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  2.00(3H, s),  $\delta$  7.31 (2H, d, J = 8.0 Hz),  $\delta$  7.52-7.54 (3H, m),  $\delta$  7.67 (2H, d, J = 8.4 Hz),  $\delta$  7.92 (2H, d, J = 8.4 Hz); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  14.5, 93.6, 115.3, 115.3, 121.9, 127.6, 127.9, 128.7, 129.1, 129.8, 132.4, 134.1, 150.9, 160.5, 164.5; IR (KBr): 2960, 2918, 2849, 2227, 1740, 1620, 1587, 1540, 1488, 1399, 1186, 1161, 1079, 1009, 966, 827 cm<sup>-1</sup>; HRMS (ESI) Calcd for C<sub>19</sub>H<sub>12</sub>BrNNaO<sub>2</sub> ([M+Na]<sup>+</sup>) 387.9944. Found: 387.9932



**5-Methyl-6-oxo-4-phenyl-2-p-tolyl-6H-pyran-3-carbonitrile (1n):** white solid; Mp: 133-134 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  1.99(3H, s),  $\delta$  2.43(3H, s),  $\delta$  7.30-7.34 (4H, m),  $\delta$  7.45-7.53 (3H, m)  $\delta$  7.95 (2H, d, J = 8.4 Hz); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  14.4, 21.7, 92.8, 115.7, 121.0, 127.1, 127.9, 128.4, 129.0, 129.7, 129.7, 134.5, 143.5, 151.2, 160.8, 165.8; IR (KBr): 2958, 2923, 2853, 2227, 1734, 1616, 1541, 1507, 1340, 1040, 1011, 852, 820 cm<sup>-1</sup>; HRMS (ESI) Calcd for C<sub>20</sub>H<sub>15</sub>NNaO<sub>2</sub> ([M+Na]<sup>+</sup>) 324.0995. Found: 324.1005



**2-(4-Methoxy-phenyl)-5-methyl-6-oxo-4-phenyl-6H-pyran-3-carbonitrile** (10): white solid; Mp: 121-122 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  1.98(3H, s),  $\delta$  3.88(3H, s),  $\delta$  7.01(2H, d, J = 9.2 Hz),  $\delta$  7.30-7.32 (2H, m),  $\delta$  7.49-7.55 (3H, m)  $\delta$  8.06 (2H, d, J = 8.8 Hz); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  14.3, 55.6, 91.8, 114.4, 116.0, 120.3, 122.2, 127.9, 128.9, 129.6, 130.4, 134.6, 151.4, 160.8, 163.1, 165.4; IR (KBr): 2958, 2922, 2850, 2224, 1733, 1605, 1540, 1506, 1345, 1262, 1181, 1026, 967, 853, 835 cm<sup>-1</sup>; HRMS (ESI) Calcd for C<sub>20</sub>H<sub>15</sub>NNaO<sub>3</sub> ([M+Na]<sup>+</sup>) 340.0944. Found: 340.0954



**3-methyl-2-oxo-4-phenyl-6-propyl-2H-pyran-5-carbonitrile** (**1p**): white solid; Mp: 93-94 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  1.06(3H, t, *J* = 7.2 Hz),  $\delta$  1.80-1.89 (2H, m),  $\delta$  1.95(3H, s),  $\delta$  2.81(3H, t, *J* = 7.2 Hz),  $\delta$  7.26-7.28 (2H, m),  $\delta$  7.49-7.51 (3H, m); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  13.5, 14.2, 20.8, 35.4, 95.2, 114.6, 120.5, 127.8, 128.9, 129.7, 134.0, 149.6, 161.1, 172.0; IR (KBr): 2963, 2924, 2851, 2228, 1736, 1624, 1559, 1458, 1366, 1023, 760, 703 cm<sup>-1</sup>; HRMS (EI) Calcd for C<sub>16</sub>H<sub>15</sub>NO<sub>2</sub> (M<sup>+</sup>) 253.1103. Found: 253.1105

#### LC/MS Experimental Section of the Catalytic Reaction

The reaction orders for activated alkenes **2a**, Aryl Acrylate **3**, and DABCO were determined by an integral method under pseudo-first-order reaction condition. **General procedure:** To a stirred solution of activated alkenes **2a** (23.3 mg, 0.10 mmol) in

CH<sub>3</sub>CN (1.0 mL) at 25 °C were added Phenyl Acrylate **3a** (2.0 - 10.0 equiv) and DABCO (0.005 – 0.030 mmol). The mixture was stirred at 25 °C and samples (0.050 mL) were withdrawn with a micropipettor at set intervals, diluted by methanol to 1.0 mL, and the solution were analyzed by HPLC (XD8-C18 column,  $\lambda = 280$  nm, CH<sub>3</sub>OH/H<sub>2</sub>O = 50/50 – 80/20, flow rate = 1.0 mL/min, sample size = 0.0010 mL).





Figure 1. LC/MS of the reaction

The conversion C, was calculated using the equation below:

$$C = \frac{\text{Area (1a)}}{a * \text{Area (2a)} + \text{Area (1a)}}$$
 a: response factor (1)

The rate equation for this reaction could be expressed as:

rate = 
$$-\frac{d[2a]}{dt}$$
 = k  $[2a]^{x}[3a]^{y}[DABCO]^{z}$  (2)

Under pseudo-first-order reaction conditions, if [3a] >> [2a] and DABCO as catalyst, equation (2) can be expressed as:

rate = 
$$-\frac{d[2a]}{dt}$$
 =  $k_{obs} [2a]^{X}$   $k_{obs} = k[3a]^{y} [DABCO]^{z}$  (3)

Then the conversion (C) could be expressed as:

$$C = 1 - [2a]_t / [2a]_0$$
 (4)

So if the reaction is zero-order for 2a, x = 0, on integrating equation (3) yields:

$$[2a]_0 - [2a]_t = C[2a]_0 = k_{obs}t$$
(5)

It is linearity between C and t.

If the reaction is first-order for 2a, x = 1, on integrating equation (3) yields:

$$-\ln\frac{[\mathbf{2a}]_{t}}{[\mathbf{2a}]_{0}} = \ln(1-C) = k_{obs}t$$
(6)

It is linearity between  $-\ln(1 - C)$  and t.

And if the reaction is second-order for 2a, x = 2, on integrating equation (3) yields:

$$\frac{1}{[2a]_{t}} - \frac{1}{[2a]_{0}} = \frac{1}{1 - C} * \frac{1}{[2a]_{0}} - \frac{1}{[2a]_{0}} = k_{obs}t$$
(7)

It is linearity between 1/(1 - C) and t.

Thereafter we draw curves of C - t,  $-\ln(1 - C) - t$ , and 1/(1 - C) - t (Figure 2). We can see that the linearity between  $-\ln(1 - C)$  and t, so this reaction is first-order for activated alkene **2a**.





**Figure 2.** Curves of C – t,  $-\ln(1 - C) - t$ , and 1/(1 - C) - t, and reaction conditions: **2a** (0.20 mmol, 1.0 equiv.) and **3a** (0.50 mmol) stirred in CH<sub>3</sub>CN (2.0 mL) in the presence of DABCO(0.040 mmol).

Then we change the amount of Phenyl Acrylate 3a (Figure 3), and the pseudo-first-order rate constant  $k_{obs}$  doesn't increase linearly or exponentially related to the amount of Phenyl Acrylate. Therefore the reaction of 3a with DABCO is a fast reaction, and the reaction is zero-order for 3a.





Figure 3. Reaction conditions: 2a (0.10 mmol, 1.0 equiv.) and 3a (0.20-0.40 mmol) stirred in  $CH_3CN$  (1.0 mL) in the presence of DABCO(0.020 mmol).

Using different amounts of DABCO (Table 1), the plot shows a linear relationship between the pseudo-first-order rate constants and the amounts of DABCO (Figure 4), so the reaction is the first-order for DABCO.









**Table 1.** Data for the reaction of **2a** (0.10 mmol, 1.0 equiv.) with **3a** (0.40 mmol, 4.0 equiv) in the presence of DABCO (0.010-0.10 mmol).) stired in CH<sub>3</sub>CN (1 mL) at 25 °C.

Entry	<b>2a</b> (mmol)	<b>3a</b> (mmol)	DABCO (mmol)	$k_{obs}$ (min <sup>-1</sup> )
1	0.10	0.40	0.010	0.00665
2	0.10	0.40	0.020	0.01358
3	0.10	0.40	0.040	0.0304
4	0.10	0.40	0.050	0.03923
5	0.10	0.40	0.065	0.04728
6	0.10	0.40	0.080	0.06185
7	0.10	0.40	0.10	0.06669







信号 1: MWD1 A, Sig=280,4 Ref=360,100

峰 保留时间 类型	峰宽	峰面积	峰高	峰面积
# [min]	[min]	[mAU*s]	[mAU]	olo
1 12.276 BB	0.1576	716.19324	66.54778	100.0000
总量:		716.19324	66.54778	

Figure 5. LC of 3a



峰伤	民留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	olo
1	2.655	BV	0.2714	69.71177	4.03763	6.3952
2	3.026	VB	0.1035	159.45821	22.83727	14.6282
3	7.608	BB	0.1420	51.48448	5.36205	4.7230
4	13.924	BB	0.1422	711.32898	75.30703	65.2553
5	20.438	VV	0.1470	53.31932	5.31597	4.8914
6	23.083	VV	0.3340	44.76884	2.02426	4.1070

总量:

1090.07159 114.88422

Figure 6. LC of 1a



<pre># [min] [min] [mAU*s] [mAU]      </pre>	可积
1 3.013 VB 0.0972 62.94300 9.76031 7.	8
1 3.013 VB 0.0972 62.94300 9.76031 7.	
2 7 545 BB 0 1391 61 71399 6 59878 6	0492
2 1.545 55 0.1551 01.11555 0.55010 0.	9115
3 10,723 BV 0,1542 25,78940 2,42309 2,	8882
4 10.900 VB 0.2644 41.15788 2.37236 4.	6094
5 12.205 BB 0.1592 386.88120 36.05079 43.	3280
6 13.130 BB 0.1361 21.01845 2.31149 2.	3539
7 13.819 BB 0.1372 220.60283 23.99937 24.	7060
8 16.437 BV 0.2201 24.62384 1.77225 2.	7577
9 21.318 VV 0.2141 34.73712 2.32805 3.	8903
10 22.298 VB 0.1143 13.44596 1.73796 1.	5059



892.91365 89.35446



峰伯	呆留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	010
1	2.997	BB	0.0973	74.45726	11.53662	8.5817
2	7.522	BB	0.1400	56.29700	5.96833	6.4886
3	10.689	BB	0.2994	51.42200	2.27750	5.9267
4	12.175	BB	0.1598	302.46292	28.04434	34.8607
5	13.106	BB	0.1373	15.54062	1.72179	1.7912
6	13.800	BB	0.1403	294.74115	31.75894	33.9707
7	16.420	BV	0.2250	30.54269	2.13407	3.5202
8	21.314	VV	0.1684	26.89161	2.44348	3.0994
9	22.296	VB	0.1076	15.27748	2.13176	1.7608



867.63272 88.01683

I



峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 *
1	2.999	BB	0.0971	88.16547	13.69994	9.6525
2	7.507	BB	0.1411	55.91964	5.97801	6.1221
3	10.680	BB	0.3182	45.36334	1.84950	4.9664
4	12.167	BB	0.1596	265.92932	24.70106	29,1143
5	13.801	BB	0.1400	373.55573	40.35288	40.8973
6	16.425	BV	0.2222	36.49566	2.56150	3.9956
7	21.321	VV	0.1663	28.98069	2.63555	3.1728

0.1097

信号 1: MWD1 A, Sig=280,4 Ref=360,100

总量:

8

22.296 VB

913.39894 94.36205

2.58362

2.0789

18.98909



峰亻	呆留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	010
		-				
1	2.998	VB	0.0976	93.81314	14.46880	10.4827
2	7.510	BB	0.1387	51.67582	5.54668	5.7743
3	12.171	BB	0.1593	220.34409	20.52264	24.6213
4	13.801	BB	0.1400	408.44757	44.11532	45.6400
5	16.423	BV	0.2265	38.40614	2.69141	4.2915
6	16.688	VB	0.1257	15.01612	1.79362	1.6779
7	20.326	VV	0.1482	19.68819	1.94270	2.2000
8	21.319	VV	0.1667	27.37210	2.48038	3.0586
9	22.297	VB	0.1113	20.16946	2.69410	2.2537
总量	:			894.93262	96.25565	

Figure 7: Reaction conditions: 2a (0.10 mmol, 1.0 equiv.) and 3a (0.40 mmol) stirred in CH<sub>3</sub>CN (1.0 mL) in the presence of DABCO(0.010 mmol), samples was withdrawn at 60 min, 90 min, 120 min, 150 min.



峰(	呆留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	010
		-	-		-	
1	3.000	VB	0.0970	61.41798	9.55834	6.4556
2	7.514	BB	0.1389	70.58370	7.55913	7.4190
3	10.698	BB	0.3290	109.39551	4.32673	11.4984
4	12.188	BB	0.1609	504.85190	46.40965	53.0643
5	13.117	BB	0.1389	20.67468	2.25626	2.1731
6	13.808	BB	0.1372	184.47229	20.07404	19.3896
总量	:			951.39606	90.18416	



	峰伢	民留时间	类型	峰宽	峰面积	峰高	峰面积
	#	[min]		[min]	[mAU*s]	[mAU]	010
-	-		-				
	1	2.997	BB	0.0971	95.56922	14.84975	9.3122
	2	7.509	BB	0.1413	60.32229	6.43695	5.8778
	3	10.690	BB	0.3221	72.23618	2.92554	7.0387
	4	12.165	BB	0.1606	315.88522	29.09933	30.7798
	5	13.787	BB	0.1377	391.76981	42.43610	38.1739
	6	16.405	BV	0.2226	40.58530	2.87613	3.9546
	7	21.303	VV	0.1681	29.65074	2.65819	2.8892
	8	22.289	VB	0.1062	20.25716	2.87365	1.9739

总量:

1026.27592 104.15565



峰伐	录留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	00
		-				
1	3.008	BB	0.0970	106.30280	16.54306	10.1197
2	7.529	BB	0.1459	55.85954	5.62356	5.3177
3	10.714	BB	0.3245	46.34147	1.86125	4.4116
4	12.180	BB	0.1601	201.01541	18.59906	19.1360
5	13.810	BB	0.1379	484.99591	52.41713	46.1701
6	16.415	BV	0.2171	47.41262	3.39248	4.5135
7	16.681	VB	0.1260	18.08290	2.15188	1.7214
8	19.474	VV	0.1536	20.85441	1.93646	1.9853
9	20.315	VV	0.1513	19.55656	1.88141	1.8617
10	21.312	VV	0.1696	27.42867	2.46925	2.6111
11	22.293	VB	0.1063	22.60473	3.20365	2.1519

总量:

1050.45503 110.07918



峰亻	呆留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	olo
		-				
1	2.992	BB	0.0971	115.50469	17.93197	11.3257
2	7.503	BB	0.1394	48.60479	5.18304	4.7659
3	12.159	BB	0.1619	152.60533	13.92142	14.9636
4	13.787	BB	0.1396	549.74646	59.59314	53.9051
5	16.390	BV	0.2202	51.41196	3.65181	5.0412
6	16.661	VB	0.1305	23.52216	2.67618	2.3065
7	19.464	VV	0.1502	18.94415	1.80876	1.8576
8	20.305	VV	0.1412	19.72565	2.07006	1.9342
9	21.306	VV	0.1567	18.46285	1.84541	1.8104
10	22.289	BB	0.1032	21.31369	3.22287	2.0899
总量	:			1019.84173	111.90466	

Figure 8: Reaction conditions: 2a (0.10 mmol, 1.0 equiv.) and 3a (0.40 mmol) stirred in CH<sub>3</sub>CN (1.0 mL) in the presence of DABCO(0.020 mmol), samples was withdrawn at 20 min, 50 min, 80 min, 110 min.



峰亻	呆留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	olo
1	3.010	VB	0.0977	41.89275	6.46055	4.9976
2	7.560	BB	0.1378	70.38213	7.61692	8.3962
3	10.734	BB	0.3370	123.30659	4.74809	14.7099
4	12.243	BB	0.1644	509.77341	45.60612	60.8135
5	13.860	BB	0.1382	92.90263	10.20916	11.0828
总量	:			838.25751	74.64085	





信号 1: MWD1 A, Sig=280,4 Ref=360,100

峰亻	呆留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	olo
		-		-		I
1	3.078	BB	0.0990	74.77922	11.32319	9.3408
2	7.711	BB	0.1396	53.90237	5.73795	6.7330
3	10.928	BB	0.3395	81.46015	3.09057	10.1753
4	12.430	BB	0.1638	270.45825	24.31040	33.7832
5	14.051	BB	0.1378	289.08975	31.29187	36.1105
6	16.658	BV	0.2196	30.87998	2.22868	3.8573
总量	:			800.56973	77.98267	



峰伐	录留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	olo
		-				
1	3.081	BB	0.0992	113.14987	17.09990	11.9202
2	7.727	BB	0.1408	49.81602	5.24762	5.2481
3	12.450	BB	0.1636	130.06317	11.71075	13.7020
4	14.072	BB	0.1400	539.17407	58.23157	56.8013
5	16.672	BV	0.2217	50.64828	3.60983	5.3357
6	16.920	VB	0.1222	15.00184	1.82007	1.5804
7	21.510	VV	0.1896	26.80747	2.06334	2.8241
8	22.456	VB	0.1214	24.56787	2.94325	2.5882

总量:

949.22859 102.72632



信号 1: MWD1 A, Sig=280,4 Ref=360,100

峰亻	呆留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	olo
		-				
1	3.068	BB	0.0992	121.72912	18.38698	12.4646
2	7.678	BB	0.1392	41.73550	4.46073	4.2735
3	12.386	BB	0.1623	69.10355	6.28429	7.0759
4	14.010	BB	0.1404	623.01587	67.06874	63.7942
5	16.611	BV	0.2224	60.32021	4.28062	6.1765
6	16.858	VB	0.1256	20.04559	2.39576	2.0526
7	20.474	VV	0.1493	18.84544	1.84295	1.9297
8	22.421	VB	0.1079	21.80673	2.96130	2.2329
总量	:			976.60201	107.68136	

**Figure 9:** Reaction conditions: 2a (0.10 mmol, 1.0 equiv.) and 3a (0.40 mmol) stirred in CH<sub>3</sub>CN (1.0 mL) in the presence of DABCO(0.040 mmol), samples was withdrawn at 5 min, 20 min, 35 min, 50 min.



峰仍	民留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	olo
		-				
1	3.060	BB	0.0996	37.17531	5.59115	5.0897
2	7.662	BB	0.1422	59.64671	6.20072	8.1663
3	10.883	BB	0.3695	112.99540	3.90564	15.4704
4	12.373	BB	0.1646	427.53595	37.63037	58.5346
5	13.984	BB	0.1399	93.04564	9.87565	12.7390



730.39900 63.20354



峰仍	民留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	010
		-	-			
1	3.049	BB	0.1002	83.51424	12.46599	9.5500
2	7.624	BB	0.1443	47.26708	4.90857	5.4051
3	10.820	BB	0.3353	73.86325	2.84075	8.4464
4	12.316	BB	0.1665	250.31001	21.71899	28.6235
5	13.929	BB	0.1419	359.01440	38.09886	41.0541
6	16.542	BV	0.2155	41.05641	2.96627	4.6949
7	22.376	VB	0.1335	19.46629	2.07436	2.2260



874.49169 85.07380



信号 1: MWD1 A, Sig=280,4 Ref=360,100

峰(	呆留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	olo
		-		-		
1	3.047	BB	0.1006	89.66288	13.31207	11.7630
2	7.629	BB	0.1425	43.02876	4.46109	5.6450
3	12.321	BB	0.1676	140.59151	12.27780	18.4445
4	13.942	BB	0.1404	426.84549	45.10197	55.9987
5	16.548	BV	0.2183	46.66920	3.35449	6.1226
6	22.376	VB	0.1102	15.44462	2.04377	2.0262
总量	:			762.24245	80.55120	



信号 1: MWD1 A, Sig=280,4 Ref=360,100

峰亻	呆留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	0/0
		-				
1	3.042	BB	0.0999	115.37619	17.28947	12.2671
2	7.618	BB	0.1448	40.60086	4.19957	4.3168
3	12.312	BB	0.1697	106.55049	9.16372	11.3288
4	13.937	BB	0.1425	586.09625	61.87414	62.3155
5	16.543	BV	0.2198	60.55618	4.31293	6.4385
6	16.787	VB	0.1242	14.62624	1.77397	1.5551
7	22.373	VB	0.1074	16.72449	2.28409	1.7782
总量	:			940.53070	100.89791	

Figure 10: Reaction conditions: 2a (0.10 mmol, 1.0 equiv.) and 3a (0.40 mmol) stirred in  $CH_3CN$  (1.0 mL) in the presence of DABCO(0.050 mmol), samples was withdrawn at 5 min, 20 min, 35 min, 50 min.



峰侈	民留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	olo
		-		-		
1	3.000	BB	0.0974	62.10007	9.60540	7.0299
2	7.534	BB	0.1408	70.39930	7.55163	7.9694
3	10.699	BB	0.4279	134.59480	3.98609	15.2365
4	12.212	BB	0.1692	445.09772	38.40524	50.3863
5	13.833	BB	0.1370	171.17810	18.66179	19.3778



883.37000 78.21015



峰伐	录留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	olo
		-				
1	3.032	BB	0.0977	107.59470	16.58969	10.5293
2	7.609	BB	0.1394	52.06408	5.55000	5.0950
3	10.791	BB	0.4261	65.63894	1.94299	6.4235
4	12.291	BB	0.1652	209.90802	18.38210	20.5417
5	13.906	BB	0.1387	487.74356	53.35234	47.7309
6	16.520	BV	0.2129	54.74632	4.02019	5.3575
7	21.384	VB	0.2201	29.13498	1.86627	2.8512
8	22.358	BB	0.0994	15.03008	2.26547	1.4709

总量:

1021.86068 103.96904



峰(	呆留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	010
				-		
1	3.006	BB	0.0972	140.58888	21.81411	11.7144
2	7.535	BB	0.1387	56.75177	6.09179	4.7288
3	12.191	BB	0.1677	110.72565	9.66403	9.2261
4	13.828	BB	0.1370	655.95917	71.50116	54.6569
5	16.443	BV	0.2202	60.26036	4.28096	5.0211
6	16.708	VB	0.1219	14.90356	1.81266	1.2418
7	19.518	VB	0.1745	21.04382	1.72272	1.7534
8	20.365	VV	0.1843	24.35855	1.84153	2.0296
9	21.014	VV	0.4900	70.52942	1.95907	5.8768
10	22.339	BB	0.2050	45.01825	2.87030	3.7511

总量:

1200.13943 123.55833



峰亻	呆留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	00
		-				
1	3.024	VB	0.0974	136.85973	21.16519	12.7974
2	7.583	BB	0.1370	43.38928	4.73284	4.0572
3	12.258	BB	0.1672	67.58424	5.92085	6.3196
4	13.893	BB	0.1370	707.94244	77.20992	66.1980
5	16.504	BV	0.2179	71.63171	5.16049	6.6981
6	16.761	VB	0.1227	17.90569	2.20569	1.6743
7	22.348	VB	0.1224	24.11911	2.85963	2.2553
总量	:			1069.43219	119.25462	

Figure 11: Reaction conditions: 2a (0.10 mmol, 1.0 equiv.) and 3a (0.40 mmol) stirred in  $CH_3CN$  (1.0 mL) in the presence of DABCO(0.065 mmol), samples was withdrawn at 5 min, 20 min, 35 min, 50 min.



峰	保留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	olo
1	3.112	BB	0.1024	55.58209	8.06914	7.4627
2	7.766	BB	0.1445	56.37265	5.84590	7.5689
3	10.984	BB	0.4261	137.72073	4.07669	18.4911
4	12.518	BB	0.1729	335.89642	28.21556	45.0992
5	14.116	BB	0.1422	159.22240	16.85362	21.3780



744.79429 63.06090



信号 1: MWD1 A, Sig=280,4 Ref=360,100

峰(	呆留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	olo
		-	-	-		
1	3.091	BB	0.1019	84.78149	12.38339	10.1591
2	7.735	BB	0.1458	42.61472	4.36841	5.1064
3	10.942	BV	0.4492	72.55631	2.02919	8.6942
4	12.483	VB	0.1764	210.42963	17.23916	25.2151
5	14.100	BB	0.1435	365.85782	38.26925	43.8396
6	16.667	BV	0.2230	40.65342	2.84086	4.8714
7	22.435	VB	0.1194	17.64421	2.15828	2.1143
总量	:			834.53761	79.28853	



信号 1: MWD1 A, Sig=280,4 Ref=360,100

峰(	呆留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	olo
				-		
1	3.079	BB	0.1017	96.64320	14.15493	12.2801
2	7.723	BB	0.1460	42.20673	4.32072	5.3631
3	12.460	BB	0.1765	123.25652	10.08790	15.6618
4	14.085	BB	0.1432	458.08643	48.06125	58.2076
5	16.659	BV	0.2233	49.13049	3.42550	6.2429
6	22.433	VB	0.1141	17.66389	2.23779	2.2445



786.98726 82.28807



峰亻	呆留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	0/0
1	3.091	BB	0.1018	112.25680	16.41697	12.6361
2	7.743	BB	0.1454	44.73901	4.60279	5.0360
3	12.472	BB	0.1730	65.72039	5.59465	7.3977
4	14.096	BB	0.1435	567.86096	59.39314	63.9207
5	16.660	BV	0.2218	57.12547	3.97245	6.4303
6	16.931	VB	0.1268	14.84737	1.71925	1.6713
7	22.422	VB	0.1152	25.83375	3.30314	2.9079
总量	:			888.38374	95.00239	

**Figure 12:** Reaction conditions: 2a (0.10 mmol, 1.0 equiv.) and 3a (0.40 mmol) stirred in CH<sub>3</sub>CN (1.0 mL) in the presence of DABCO(0.080 mmol), samples was withdrawn at 5 min, 15 min, 25 min, 35 min.



峰	保留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	oldi
1	3.026	BB	0.0995	77.94201	11.74003	9.0257
2	7.591	BB	0.1420	61.38472	6.39259	7.1083
3	10.788	BB	0.3678	116.00281	4.10371	13.4331
4	12.284	BB	0.1689	296.13895	25.23921	34.2929
5	13.902	BB	0.1399	275.35159	29.22096	31.8857
e	16.507	BB	0.2295	36.73850	2.41412	4.2543



863.55857 79.11062



峰(	呆留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	00
		-				
1	3.021	BB	0.0991	80.56355	12.18958	9.5877
2	7.576	BB	0.1452	47.84114	4.93188	5.6935
3	10.760	BB	0.3333	70.84733	2.74295	8.4314
4	12.255	BB	0.1679	223.91805	19.22182	26.6480
5	13.878	BB	0.1415	302.57932	32.24258	36.0093
6	16.496	BB	0.2322	35.41078	2.29203	4.2142
7	21.883	VV	0.2269	38.72752	2.34254	4.6089
8	23.068	VB	0.3143	40.39423	1.89762	4.8072
总量	:			840.28190	77.86100	



峰侈	民留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	olo
		-				
1	3.024	BB	0.0990	98.66599	14.95859	11.3540
2	7.584	BB	0.1411	44.37298	4.66087	5.1062
3	10.777	BB	0.3483	56.45378	2.06905	6.4964
4	12.274	BB	0.1707	154.15100	13.16034	17.7389
5	13.901	BB	0.1399	439.79007	46.67947	50.6087
6	16.513	BV	0.2197	48.40938	3.40941	5.5707
7	22.370	VV	0.1535	27.15733	2.44610	3.1251



869.00054 87.38383



峰(	呆留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	010
		-	-		-	
1	3.022	VB	0.0971	107.94660	16.33644	12.6730
2	7.586	BB	0.1417	44.94269	4.69537	5.2763
3	12.271	BB	0.1697	124.09771	10.67297	14.5692
4	13.896	BB	0.1417	491.79288	52.28788	57.7368
5	16.503	BV	0.2202	51.81547	3.63757	6.0832
6	22.364	VV	0.1658	31.18868	2.56630	3.6616
总量	:			851.78402	90.19653	

Figure 13: Reaction conditions: 2a (0.10 mmol, 1.0 equiv.) and 3a (0.40 mmol) stirred in CH<sub>3</sub>CN (1.0 mL) in the presence of DABCO(0.10 mmol), samples was withdrawn at 5 min, 10 min, 15 min, 20 min.

We do two parallel experiments, Phenol(20 mmol%) was added in one and not added in the other. After 20 min, 10% hydrochloric acid solution was added to quench the reaction. And then we use LC method to get the conversion of the two reaction. We found that the conversion of the two reaction are similar. The conversion of the reaction in which phenol was added is 0.2637, and the other is 0.2452



峰	保留时间	类型	峰宽	峰面积	峰高	峰面积
#	[min]		[min]	[mAU*s]	[mAU]	00
1	3.032	VB	0.0978	105.44005	16.23417	4.0257
2	7.593	BB	0.1391	161.67261	17.29234	6.1726
3	10.768	BV	0.1506	38.54700	3.79112	1.4717
4	11.203	VV	0.5196	78.34443	2.01483	2.9912
5	12.298	VB	0.1618	1305.95337	117.41351	49.8608
6	13.216	BB	0.1400	221.07480	23.43759	8.4405
7	13.906	BB	0.1405	395.13327	42.49417	15.0860
8	16.529	BV	0.2236	63.84903	4.49911	2.4377
9	16.770	VB	0.1224	17.55872	2.17002	0.6704
10	19.577	VV	0.1565	23.11833	2.09946	0.8826
11	20.027	VV	0.1843	25.15905	1.87770	0.9606
12	20.421	VV	0.1581	20.34540	1.82392	0.7768
13	20.813	VV	0.2184	45.53719	2.88037	1.7386
14	21.419	VV	0.1813	48.17234	3.92291	1.8392
15	21.586	VB	0.1507	30.47206	2.80586	1.1634
16	22.382	VB	0.1180	38.82343	4.71931	1.4823
总量	:			2619.20107	249.47640	



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峰	6 伤	民留时间	类型	峰宽	峰面积	峰高	峰面积
ŧ	#	[min]		[min]	[mAU*s]	[mAU]	010
	-		-				
	1	3.039	VB	0.0984	90.59183	13.82819	2.4675
	2	7.604	BB	0.1395	191.74150	20.43003	5.2226
	3	10.800	BV	0.1546	54.40291	5.09379	1.4818
	4	11.314	VV	0.5141	116.55376	2.86806	3.1747
	5	12.337	VB	0.1679	1880.43750	163.86481	51.2189
	6	13.239	BB	0.1479	341.48163	34.37446	9.3012
	7	13.929	BB	0.1404	627.03400	66.28497	17.0790
	8	16.545	BV	0.2123	87.37448	6.35943	2.3799
	9	19.559	VV	0.1560	26.94733	2.45680	0.7340
-	10	20.010	VV	0.1852	27.41929	2.06173	0.7468
-	11	20.400	VV	0.1531	19.59689	1.82751	0.5338
-	12	20.793	VV	0.2104	62.59726	4.14058	1.7050
-	13	21.400	VV	0.1762	65.09319	5.57435	1.7730
-	14	21.567	VB	0.1538	41.78698	3.69796	1.1382
-	15	22.369	VB	0.1133	38.31851	5.00502	1.0437

总量:

3671.37706 337.86769

Figure 15: Reaction conditions: 2a (0.10 mmol, 1.0 equiv.) and 3a (0.40 mmol) stirred in CH<sub>3</sub>CN (1.0 mL) in the presence of DABCO(0.020 mmol), Phenol(0.020 mmol) was added.

In summary, the cross-Rauhut-Currier/transesterification reaction of activated alkene **2a** with phenyl acrylate **3a** catalyzed by DABCO and the side-product phenol is first-order for both **2a** and DABCO, and zero-order for **3a**. The rate equation could be described as follows:

1. X.-S Wu and S.-K Tian, Chem Commun., 2012, 48, 898.

Table 2. The peak area of the intermediate 7 in the reaction system at different time.<sup>a</sup>

Entry	Time	Peak area	Peak area	Peak area of inter-	Peak area of inter-
	(min)	of 2a (%)	of 1a (%)	mediate 7 (mAU*s)	mediate 7 (%)
1	20	72.8989	12.1897	33.2068	6.1500
2	60	48.1782	29.6650	56.1975	9.5883
3	120	28.7192	43.2344	75.1162	11.2313
4	160	22.1460	46.0666	79.3280	11.2758
5	200	17.8701	49.1996	90.4495	11.1938
6	240	14.5658	50.5358	83.4115	11.5594
0	240	14.3038	30.3358	83.4115	11.3394

<sup>a</sup>Reaction conditions: 2a (0.10 mmol, 1.0 equiv.) and 3a (0.40 mmol)



stirred in CH<sub>3</sub>CN (1.0 mL) in the presence of DABCO(0.015 mmol).

































