Electronic Supplementary Information (ESI)

Green and moderate route for the utilization of CO₂ - Microwave induced copolymerization with cyclohexene oxide using highly efficient double metal cyanide complex catalysts based on Zn₃[Co(CN)₆]

Manju Mamparambath Dharman, Ji-Yeon Ahn, Mi-Kyung Lee, Hye-Lim Shim, Kyung Hoon Kim, II Kim and Dae-Won Park*

Division of Chemical Engineering, Pusan National University, Gumjung-gu, Busan 609-735, Korea. Fax: +82-51-512-8563; Tel: +82-51-510-2399; E-mail: dwpark@pusan.ac.kr

   1.1. Elemental composition of DMC complexes.
   1.2. XPS spectra of DMC complexes.

2. Polymer characterizations
   2.1. FT-IR spectra of reaction mixture in CH₂Cl₂.
   2.2. ¹H-NMR spectra of representive copolymers.
   2.3. ¹³C-NMR spectra of representive copolymer.
   2.4. GPC of representive copolymers.

1.1. Elemental composition of DMC complexes.

Table S1. Elemental composition of DMC complexes

<table>
<thead>
<tr>
<th>Sample</th>
<th>%C</th>
<th>%H</th>
<th>%N</th>
<th>%Zn</th>
<th>%Co</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMC-1</td>
<td>23.46</td>
<td>3.911</td>
<td>13.83</td>
<td>29.76</td>
<td>3.61</td>
</tr>
<tr>
<td>DMC-2</td>
<td>24.10</td>
<td>4.359</td>
<td>14.06</td>
<td>19.32</td>
<td>0.9622</td>
</tr>
<tr>
<td>DMC-3</td>
<td>30.88</td>
<td>4.483</td>
<td>12.15</td>
<td>15.58</td>
<td>0.6760</td>
</tr>
<tr>
<td>DMC-4</td>
<td>23.07</td>
<td>4.435</td>
<td>13.52</td>
<td>12.09</td>
<td>0.7154</td>
</tr>
<tr>
<td>DMC-5</td>
<td>22.34</td>
<td>4.303</td>
<td>15.33</td>
<td>18.31</td>
<td>7.92</td>
</tr>
</tbody>
</table>

Obtained from elemental analysis and ICP-OES analyses.
1.2. XPS spectra of DMC complexes.

Fig. S1. XPS data of DMC-1 catalyst

Fig. S2. XPS data of DMC-2 catalyst
Supplementary Material (ESI) for Green Chemistry

This journal is © The Royal Society of Chemistry 2008

Fig. S3. XPS data of DMC-3 catalyst

Fig. S4. XPS data of DMC-4 catalyst
Fig. S5. XPS data of DMC-5 catalyst
2. Polymer characterizations.

2.1. FT-IR spectra of reaction mixture in CH$_2$Cl$_2$.

Fig. S6. Reaction condition: CHO-2.5 ml, DMC-1 - 5mg, P$_{CO2}$-9.7 bar, 100 W, 30 min

Fig. S7. Reaction condition: CHO-5 ml, DMC-1 - 5mg, P$_{CO2}$-9.7 bar, 100 W, 30 min

Fig. S8. Reaction condition: CHO-5 ml, DMC-1 - 10mg, P$_{CO2}$-9.7 bar, 200 W, 4.5 min

Fig. S9. Reaction condition: CHO-5 ml, DMC-1 - 20mg, P$_{CO2}$-9.7 bar, 100 W, 6 min
Fig. S10. Reaction condition: CHO-5 ml, DMC-1 - 10mg, \( P_{\text{CO}_2} \)-9.7 bar, 300 W, 4 min

Fig. S11. Reaction condition: CHO-5 ml, DMC-1 - 10mg, \( P_{\text{CO}_2} \)-9.7 bar, 400 W, 3.5 min

Fig. S12. Reaction condition: CHO-5 ml, DMC-2 - 5mg, \( P_{\text{CO}_2} \)-9.7 bar, 100 W, 30 min

Fig. S13. Reaction condition: CHO-5 ml, DMC-3 - 5mg, \( P_{\text{CO}_2} \)-9.7 bar, 100 W, 30 min
2.2. $^1$H-NMR spectra of representative copolymers.
2.3. $^{13}$C-NMR spectra of representative copolymer.
2.4. GPC of representative copolymers.