**Efficient methoxycarbonylation of diisobutylene over functionalized ZSM-5 supported cobalt complex catalysts**

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**Fig. S1** Reusability of in the ZSM-5iCPdPy@Co2(CO)8 for DIB methoxycarbonylation. Reaction conditions: N: Co =4:1(mol), CH3OH:DIB=15:1(mol), 6.0MPa CO, 140℃, 10h.



**Fig. S2** Reusability of in the ZSM-5iCPdPy@Co2(CO)8 for DIB methoxycarbonylation. Reaction conditions: N: Co =4:1(mol), Co2(CO)8 4wt%, 6.0MPa CO, 140℃, 10h.



**Fig. S3** Reusability of in the ZSM-5iCPdPy@Co2(CO)8 for DIB methoxycarbonylation. Reaction conditions: N: Co =4:1(mol), Co2(CO)8 4wt%, CH3OH:DIB=15:1(mol), 140℃, 10h.



**Fig. S4** Reusability of in the ZSM-5iCPdPy@Co2(CO)8 for DIB methoxycarbonylation. Reaction conditions: N: Co =4:1(mol), Co2(CO)8 4wt%, CH3OH:DIB=15:1(mol), 6.0MPa CO, 10h.



**Fig. S5** Reusability of in the ZSM-5iCPdPy@Co2(CO)8 for DIB methoxycarbonylation. Reaction conditions: N: Co =4:1(mol), Co2(CO)8 4wt%, CH3OH:DIB=15:1(mol), 6.0MPa CO, 140℃.



**Fig. S6** FT–IR spectra comparison of the fresh and 6 times reused ZSM-5iCPdPy@Co2(CO)8



**Fig. S7** N2 adsorption–desorption isotherms comparison of the catalyst fresh and 6 times reused.

**Table S1** BET surface properties of ZSM-5iCPdPy@Co2(CO)8.

|  |  |  |  |
| --- | --- | --- | --- |
| Sample | BET surfacearea (m2/g) | Pore volume (cm3/g) | Average pore width (nm) |
| Fresh | 241.7 | 0.11 | 7.04 |
| Reused 6 times | 120.4 | 0.09 | 5.76 |



**Fig. S8** (a) EDS, (b) XPS and (c) HAADF-STEM analysis ZSM-5iCPdPy@Co2(CO)8 after the methoxycarbonylation of diisobutylene.



**Fig. S9** The effect of catalyst removal on the methoxycarbonylation of DIB.Reaction conditions: N: Co =4:1(mol), Co2(CO)8 4wt%, CH3OH:DIB=15:1(mol), 6.0MPa CO, 140℃, 10h.