

# Tailoring microporosity of multi-hydroxyls hyper-crosslinked organic polymers for reinforced ambient chemical fixation of CO<sub>2</sub>

Zengjing Guo<sup>1,\*</sup>, Shuguang Ning<sup>2</sup> Shicheng Xu<sup>1</sup>, Yongying Zhang<sup>1</sup>, Yifan Dong<sup>1</sup>, Hongjing Han<sup>3,\*</sup>

<sup>1</sup>*School of Chemistry and Chemical Engineering, Liaocheng University, Liaocheng, 252000, Shandong, P. R. China*

<sup>2</sup>*Shandong Lusoftware Digital Technology Co., Ltd., Jinan, 250001, China.*

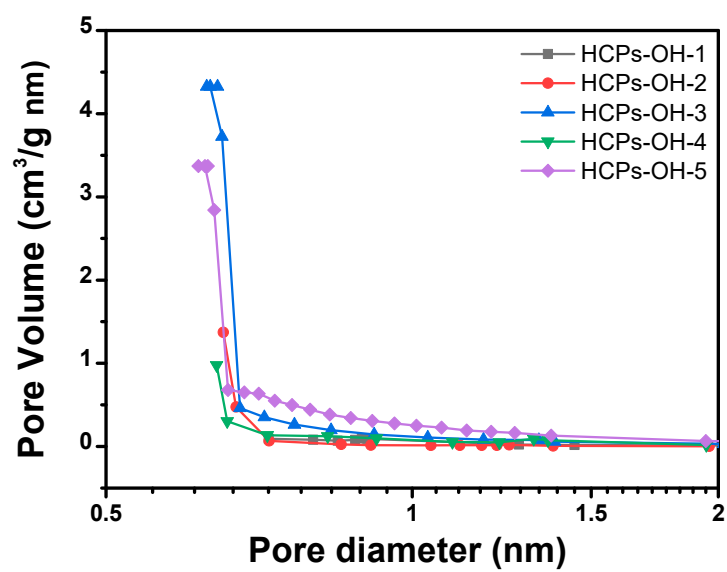
<sup>3</sup>*College of Chemistry & Chemical Engineering, Northeast Petroleum University, Daqing, 163318, China*

**Corresponding Authors\***

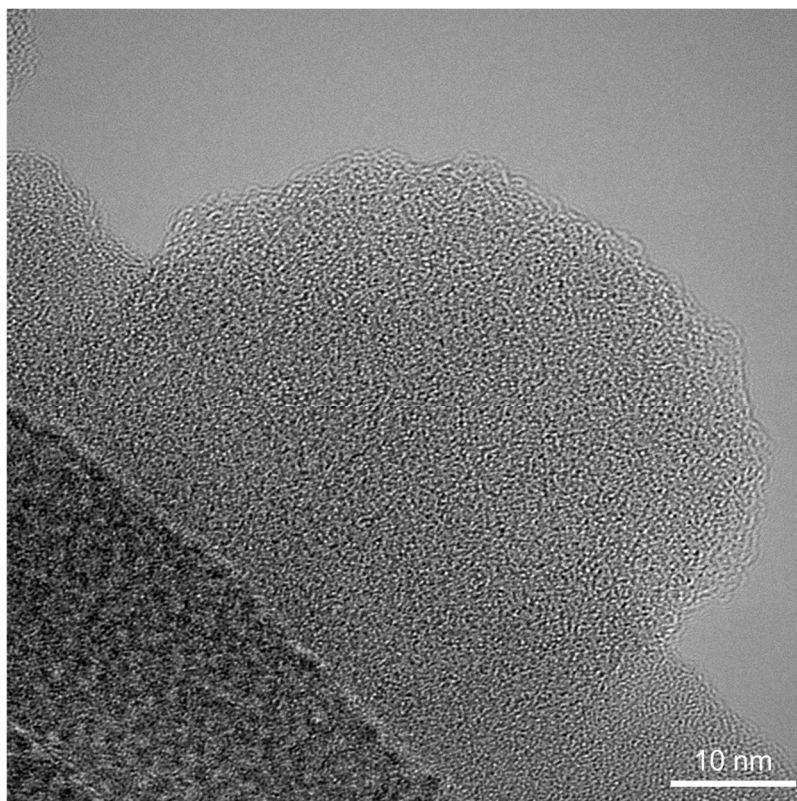
E-mail: Dr. Hongjing Han, [hongjing\\_han@163.com](mailto:hongjing_han@163.com). Dr. Zengjing Guo, [guozengjing@lcu.edu.cn](mailto:guozengjing@lcu.edu.cn).

## **Characterizations**

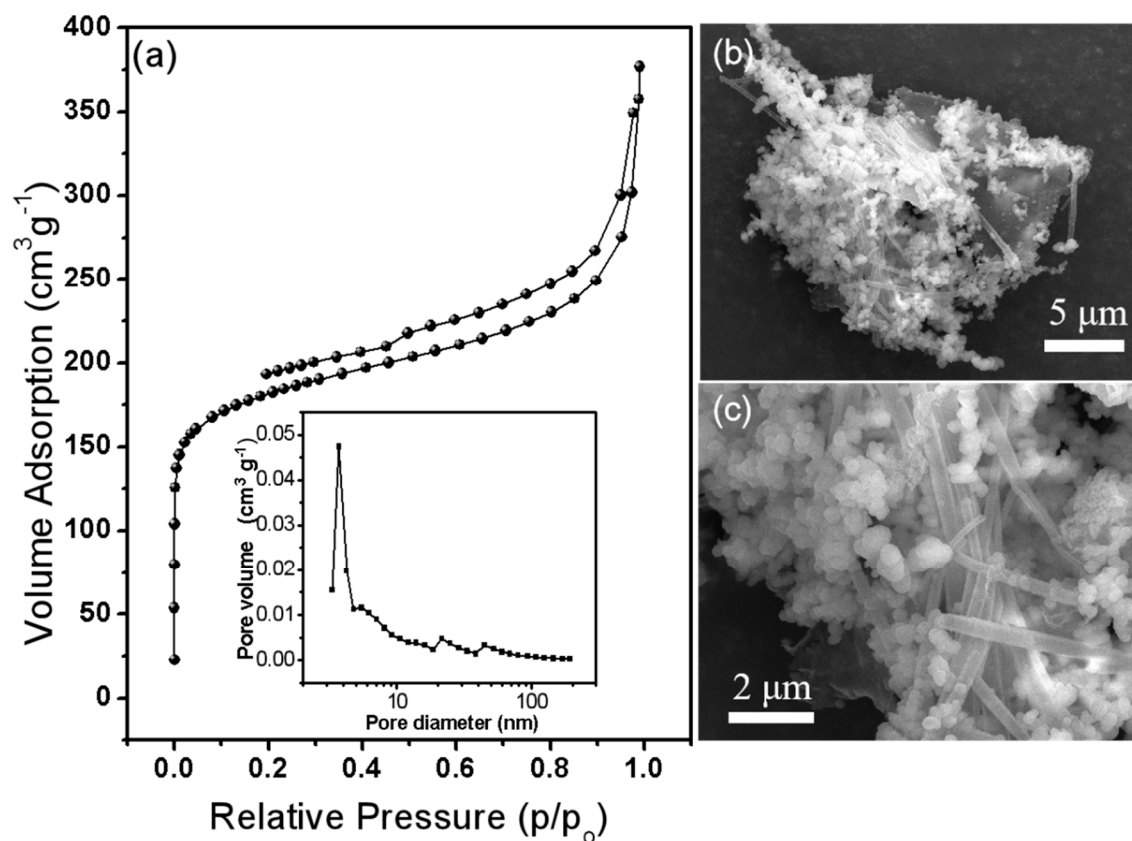
X-ray diffraction (XRD) patterns were recorded on a Smart Lab X-ray diffractometer from Rigaku. Thermogravimetry (TG) analysis was carried out with an STA409 instrument in dry air at a heating rate of 10 K min<sup>-1</sup>. Scanning electron microscope (SEM) images were registered in a HITACHI S-4800 field emission scanning electron microscope. Transmission electron microscopy (TEM) analysis was carried out on a JEM-2100 (JEOL) electron microscope operating at 200 kV. The surface chemical composition was determined by X-ray photoelectron spectroscopy (XPS, AXIS UltraDLD). Brunauer-Emmett-Teller (BET) surface area was measured at the temperature of liquid nitrogen (77 K) by using a BELSORP-MINI analyzer and the samples were degassed at 120 ° C for 3 h in a vacuum of 10<sup>-3</sup> Torr before analysis. The CHN elemental analysis was performed on an elemental analyzer Vario EL cube. CO<sub>2</sub> adsorption isotherms were measured on a Micromeritics ASAP 2020 volumetric adsorption analyzer.



**Figure S1** Micropore size distribution of various samples derived from HK method.



**Figure S2.** TEM images of HCPs-OH-3



**Figure S3.** Characterizations of the reused catalyst HCPs-OH-3. (a)  $\text{N}_2$  sorption isotherm and pore size distribution curve of the recovered catalyst HCPs-OH-3 from cycloaddition of  $\text{CO}_2$  with epichlorohydrin. The SEM images (b, c) for the used catalyst keeps the similar morphology to that of the fresh sample.

**Table S1** Cycloaddition of  $\text{CO}_2$  with epichlorohydrin under ambient conditions.<sup>a</sup>

Entry	Catalyst	Co-catalyst	Yield (%)	Sel. (%)
1	-	$\text{FeCl}_3$	<1	99
2	HCPs-OH-3	$\text{FeCl}_3$	82	99
3	HCPs-OH-3	-	81	99

<sup>a</sup> epichlorohydrin 5 mmol,  $\text{CO}_2$  0.1 MPa (balloon), catalyst 0.03g, *n*-Bu<sub>4</sub>NI 0.09g, RT, reaction time (10 h).