

## Electronic supplementary information

# Formation mechanism of rod-like ZIF-L and fast phase transformation from ZIF-L to ZIF-8 with morphology changes controlled by polyvinylpyrrolidone and ethanol

Huifen Fu,<sup>a</sup> Zhihua Wang<sup>\*b</sup>, Xun Wang,<sup>a</sup> Peng Wang,<sup>a</sup> Chong-Chen Wang<sup>\*a</sup>

<sup>a</sup> Beijing Key Laboratory of Functional Materials for Building Structure and Environment Remediation, Beijing University of Civil Engineering and Architecture, Beijing 100044, China

<sup>b</sup> State Key Laboratory of Chemical Resource, Beijing University of Chemical Technology, Beijing 100029, China

Email: [zhwang@mail.buct.edu.cn](mailto:zhwang@mail.buct.edu.cn); [wangchongchen@bucea.edu.cn](mailto:wangchongchen@bucea.edu.cn)

## Experimental section

### Reagents

Zn(NO<sub>3</sub>)<sub>2</sub> and 2-methylimidazole were purchased from J&K Scientific LTD. Poly(vinyl pyrrolidone) (PVP K30) was purchased from Beijing Yili Fine Chemical Research Institute (Beijing, China).

### Preparation of ZIFs

0.25 g PVP was dissolved in 5 mL deionized water adequately, and then 5 mL aqueous solution containing 10 mmol 2-methylimidazole was added into the solution. After a uniform solution was formed, 5 mL aqueous solution containing 1 mmol Zn(NO<sub>3</sub>)<sub>2</sub> was added into the above solution. After 2 h, the obtained product was collected by centrifuge. The obtained product was washed with ethanol for three times (8000 rpm, 10 min), and dried in an oven at 60 °C for about 1 h. If pure water was used during the washing process, the obtained products should be dried for a long time. ZIFs were also prepared when the reaction time is 2 h, 5 h, 10 h, 15 h and 24 h. In addition, ZIFs prepared in the absence of PVP were also conducted.

## Characterization

Morphology of the samples was characterized using a Hitachi HT7700 transmission electron microscopy (TEM). XRD patterns were recorded on a Dandonghaoyuan DX-2700B diffractometer using Cu K $\alpha$  radiation. FTIR spectra were recorded from 500 cm<sup>-1</sup> to 4000 m<sup>-1</sup> at room temperature using a 370MCT IR spectrophotometer. Nitrogen adsorption-desorption isotherms, pore size distributions and specific surface areas of these samples were obtained using a Belsorp II analyzer at liquid N<sub>2</sub> temperature (77 K). Before test, the samples were degassed in a vacuum at 393 K for 10 h to remove physically adsorbed components.

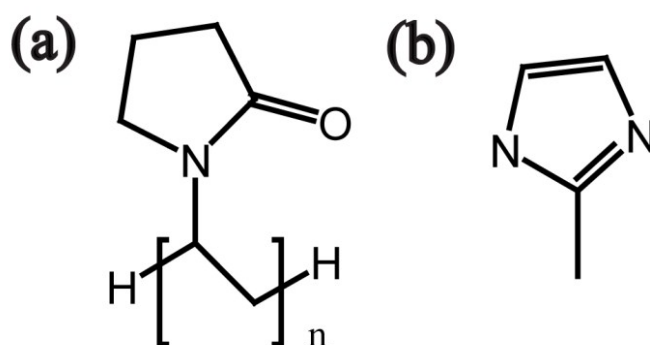


Fig. S1 Structure of (a) PVP and (b) 2-methylimidazole

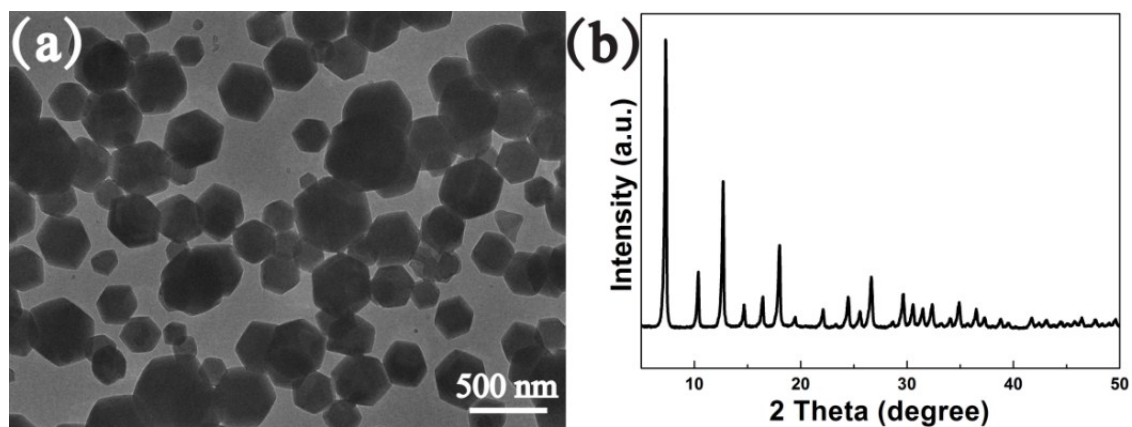


Fig. S2 (a) TEM image and (b) XRD pattern of ZIF-8 maintained in ethanol

for 30 min after separated from aqueous solution

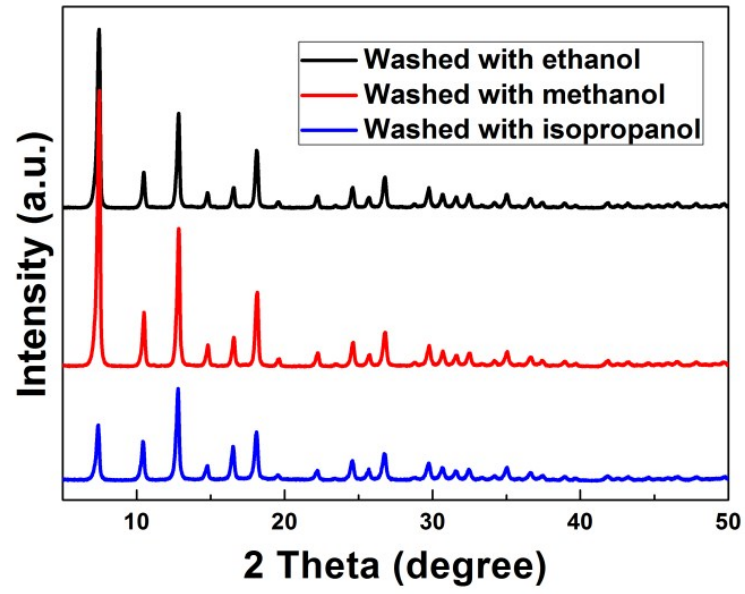


Fig. S3 XRD patterns of the ZIF-8 obtained via washing ZIF(2h) obtained in the presence of PVP with methanol, ethanol and isopropanol

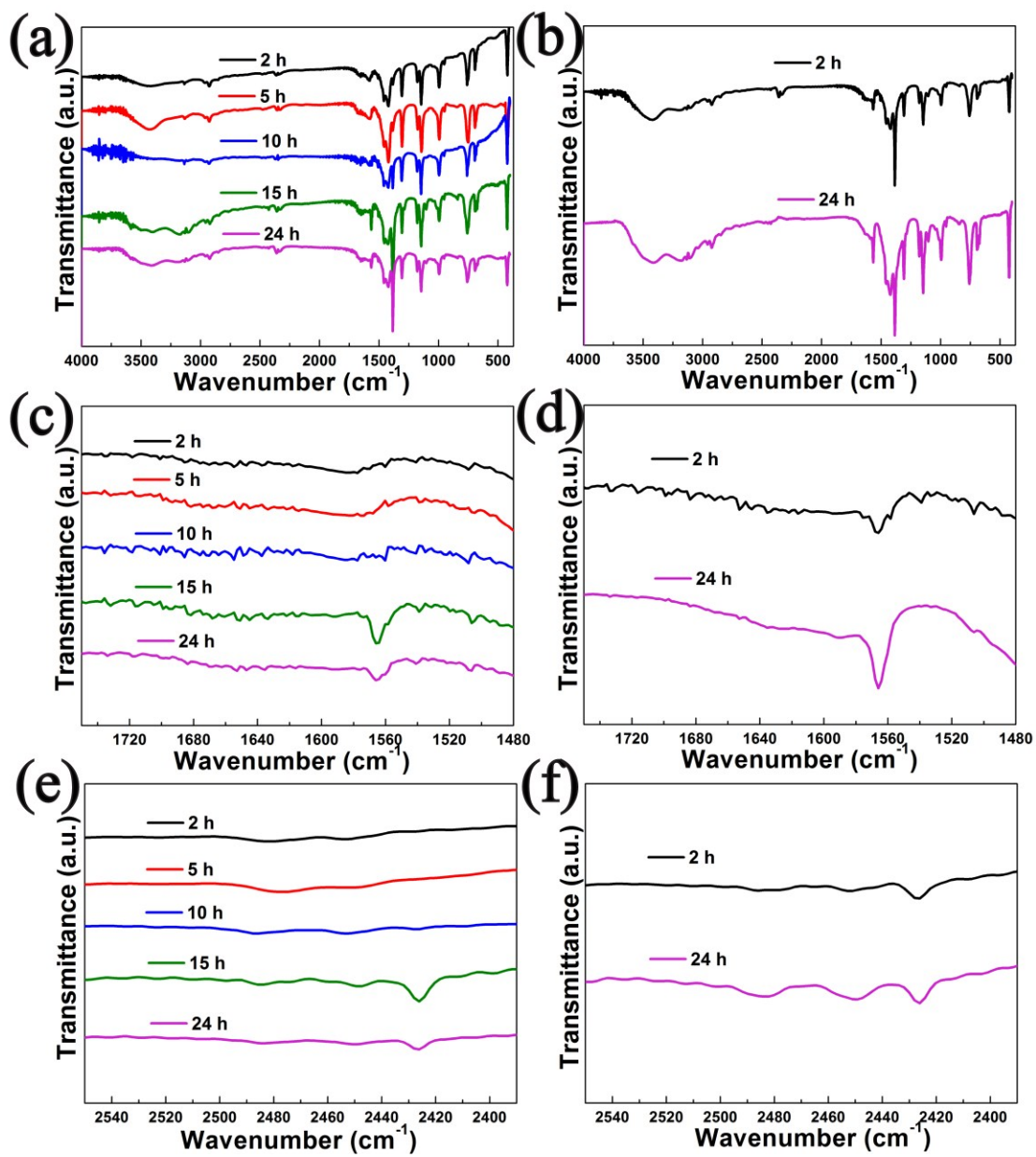


Fig. S4 FTIR spectra of ZIFs with different reaction time (a, c, e) with and (b, d, f) without PVP

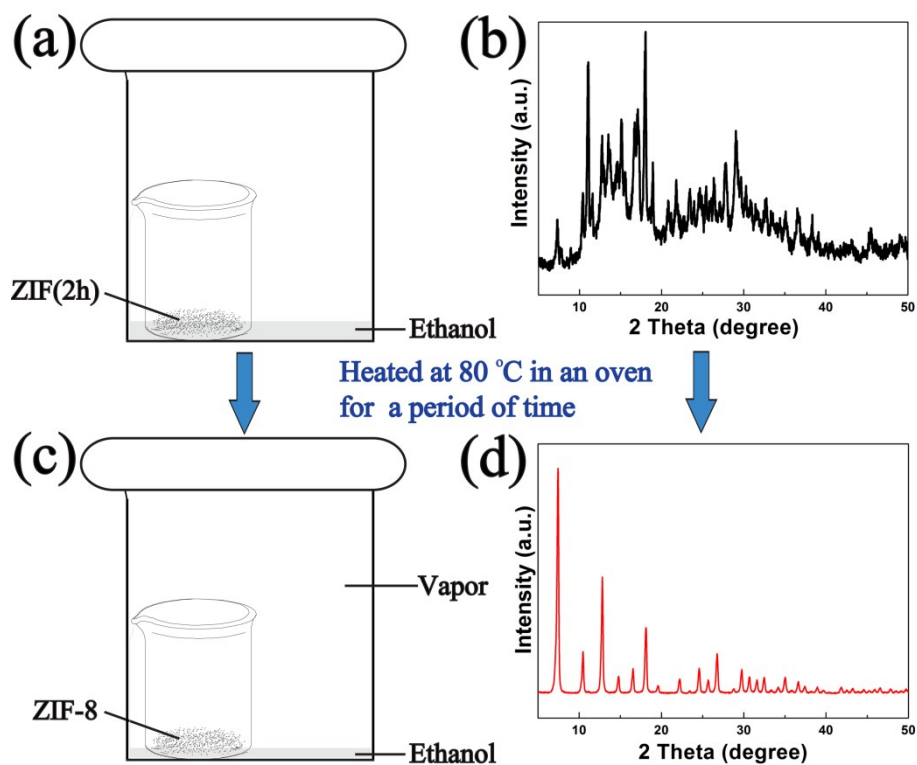


Fig. S5 (a) Schematic diagram of the used device before heating and (b) XRD pattern of ZIF(2h) prepared with PVP and washed with pure water. (c) Schematic diagram of the used device after the ZIF(2h) heating at 80 °C for a period of time and (d) XRD pattern of the sample obtained after heating the ZIF(2h) in ethanol vapor

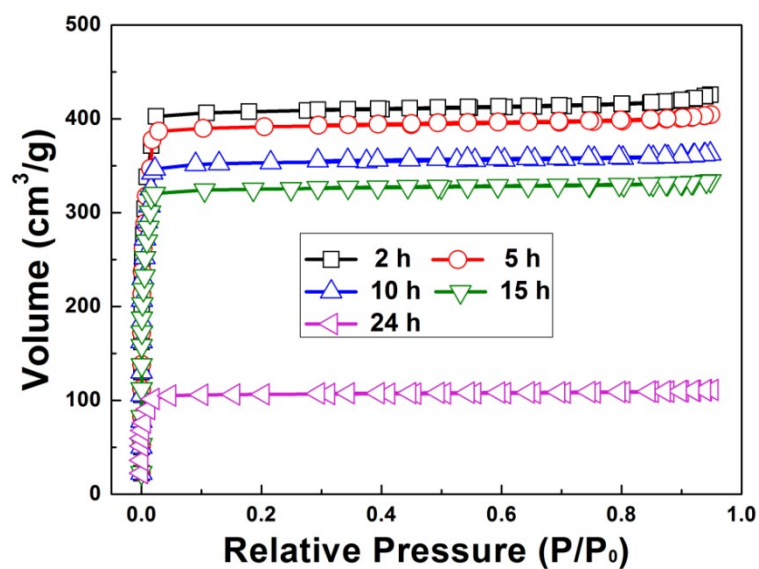


Fig. S6 Nitrogen adsorption-desorption isotherms of ZIFs washed with ethanol with different reaction time in the presence of PVP

Table S1 Langmuir specific surface of ZIFs washed with ethanol

with different reaction time in the presence of PVP

<b>Samples</b>	ZIF(2h)	ZIF(5h)	ZIF(10h)	ZIF(15h)	ZIF(24h)
<b>Sa (m<sup>2</sup>/g)</b>	1320	1294	1108	1039	326