## **Electronic Supplementary Information (ESI)**

## pH-Induced switches on oil- and water-selectivity of crosslinked polymeric membranes for gravity-driven oil-water separation

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## 1. Characterization of PBz

Characterization of the benzoxazine-containing polymer PBz has been carried out. Fourier transform infreared (FTIR): measurements were carried out with a Spectrum TWO FTIR instrument from Perkin Elmer Co. Sample was mixed with KBr and then pelleted for measurements.

<sup>1</sup>H NMR: spectra were recorded with a Varian Univitinova-500 500 MHz NMR

GPC: Molecular weight of polymer sample was measured with a gel permeation chromatography equipped with a Waters 1515 isocratic pump, Waters 2414 refractive index detcetor, and Waters styragel HR4/HR3 columns. Tetrahydrofuran was taken as the mobile phase at a flow rate of 1 mL min<sup>-1</sup>. Monodispersed polystyrene in varuous molecular weights were used asd calibration standards.

Differential scanning calorimetry (DSC): measurements was performed with a Thermal Analysis (TA) Q20 DSC. The measurements were carried out at a heating rate of 10 °C min<sup>-1</sup> under a nitrogen flow.

The characterization results are collected in Figure S1. All the spectral characterization result (FTIR and <sup>1</sup>H NMR) supports to the chemical structure of the prepared PBz polymer, and is coincident to the results reported in the literature (*Polym. Chem.*, 2012, **3**, 935-945).

It is noteworthy that PBz exhibits an exothermic peak corressponding to the ring-opening addition reaction of the benzoxazine groups (Figure S1). Hence, after thermal treatment this exothermic is not observed with the thermally crosslinked sample. The thermal reaction of PBz is illusrtated in Figure S2.

## 2. Characterization of CR-PBz-FbM

The CR-PBz-FbM sample has been applied to X-ray photoelectron spectral (XPS) measurement with a VG Microtech MT-500 ESCA (British) instrument using an Mg-Kα line

as the radiation source. The XPS spectra of CR-PBz-FbM are shown in Figure S3. The results read from the wide scan and elemental ( $C_{1s}$ ,  $N_{1s}$ , and  $O_{1s}$ ) core-level spectra are coincident to the chemical structure of CR-PBz-FbM.

Moreover, the water contact angles (WCA) of CR-PBz-FbM with water droplets in various pH values have been recorded. The data is provided in Figure S4. The WCA values slightly decrease with increasing the pH values. Nevertheless, the change is not so significant. The results suggest that the pH-induced changes on the Cr-PBz-FbM membrane take time. Due to the short measurement time, the change in the measured WCA is not significant. Nevertheless, a longer measurement time is not possible due to evaporation of the small water droplets. As a result, it is hard to acquire similar separation efficiency in mild acidic and basic solutions.



Figure S1. FTIR and <sup>1</sup>H NMR spectral characterization of PBz and DSC thermogram of PBz.



**Crosslinked PBz** 

Figure S2. Thermally crosslinking reaction of PBz.



Figure S3. XPS spectra of CR-PBz-FbM including the wide scan and elemental (C1s,  $N_{1s}$ , and  $O_{1s}$ ) core-level spectra.



Figure S4. Water contact angles of CR-PBz-FbM with water droplets in various pH values.