Supporting Information

A sustainable strategy for remediation of oil/water separation by polybenzoxazine/stearic acid functionalized porous carbon

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Synthesis of HPCs

The above mention method was used to synthesize benzoxazine monomer using hydroquinone, phenylethylamine and paraformaldehyde as precursors. The obtained benzoxazine monomer was heated stepwise in an oven at 100, 150, 180, 220, and 250 °C for 4 h, respectively. Then, the cured polybenzoxazine was further carbonized under an argon atmosphere by heating at 600 °C for 5 h with a ramp rate of 1 °C min^{-1}. Then, the obtained carbonized material, was soaked in an aqueous KOH solution in a weight ratio of KOH:carbonized sample = 2:1, for overnight, filtered and dried at 120 °C. The activation process was carried out at 700 °C for 4 h in a tube furnace under flowing argon with a ramp rate of 3 °C min^{-1}. The products were repeatedly washed with 1 M HCl and deionized water until the pH value of the filtrate reached about 7 and dried at 110 °C for 12 h. The obtained samples were denoted as HPCs.

Acid Treatment of HPCs

In a 100 mL beaker, concentrated HNO_3 (50 ml, 68 wt%) was added to 0.1 g of HPCs. The mixture was sonicated in a water bath at room temperature for 2 h with continuous stirring. After the completion of 2 h, the mixture was filtered several times using deionized water until neutral pH is obtained. The acid treated HPCs thus obtained were dried at 90 °C overnight.

Surface treatment of HPCs by Stearic acid

The acid treated HPCs were mixed with acetone for 60 min by using an ultrasonic bath. Separately, some amount of stearic acid was added to acetone and was stirred at 80 °C. The liquid media containing stearic acid, was added to HPC media and stirred under 80 °C for 4 h. The reaction mixture was then cooled to room temperature and extracted with chloroform. In order to remove the residual stearic acid, the resulting HPCs were further rinsed with hexane or cyclohexane. After filtering and washing with acetone, the samples were dried at 80 °C under vacuum oven for overnight. The obtained samples were denoted as HPCs-SA.

Instrumentation methods

Fourier transform infrared (FT-IR) spectra were obtained with a Perkin Elmer MB3000 FTIR spectrometer. The spectra were obtained at a resolution of 4 cm-1 in the IR range of 400-4000 cm-1 . Samples were prepared by grinding with KBr and compressed to form discs. Nuclear magnetic resonance (NMR) spectra were recorded by using an Agilent NMR, VNS600 at a proton frequency of 600 MHz for 1H NMR and at a carbon frequency of 150 MHz for 13C NMR. Solutions were prepared by dissolving the samples in $CDCl_3$. Differential Scanning Calorimetry was performed in a TA instrument Q10 model using 5–10 mg of the sample at a heating rate of 10 oC min-1 in a N2 atmosphere The morphology of the material was examined by scanning electron microscopy (FESEM, Hitachi S-4800) at an accelerating voltage of 30 kVThe prepared materials were characterized by various physicochemical techniques such as field emission scanning electron microscopy (FESEM)

The oil/water separation driven by gravity was conducted using a home-made filtration device of 2.5 cm in diameter. Pbz-MS/HPCs-SA (6%). is immersed in various oils and other organic solvents until saturated, and then weighed the saturated sponge quickly. The saturated absorption weight by Pbz-MS/HPCs-SA (6%). was determined by the following equation.

$Qw = M_1 - M_0/M_0$ ------------------------- (1)

where, M_0 is the initial weight of Pbz-MS/HPCs-SA (6%). M_1 is the final weight of Pbz-MS/HPCs-SA (6%) after adsorbing various oils and solvents. Qw is the saturated absorption capacity by Pbz-MS/HPCs-SA (6%). The separation efficiency (η (%)) was calculated to evaluate the oil rejection coefficient according to equation [24].

$\eta(\%) = [1 - (C_1 / C_0)] * 100$ ------------ (2)

where C_0 and C_1 are the oil concentration of oil/water mixture before separation and the oil concentration of collected water after separation, respectively.