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Development of Ion Adsorbent from Polybenzoxazine-based Nanoporous Materials

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Adsorption is a well-established technique to remove metal ions. The existence of Ca(II) and Mg(II) ions in water leads to problems in cooling and heating systems including clogging pipeline or the other industrial machines. In this work, an alkali-earth metals model solution, Ca(II) and Mg(II), was used to study the efficiency of using nano porous polybenzoxazine as an alkali-earth metal ions adsorbent. Nano porous polybenzoxazine was synthesized from bisphenol-A, formaldehyde and tetraethylenepentamine (TEPA) via a sol-gel process. The difference in solubility parameters between solvent and polymer affected the pore structure during phase separation. The benzoxazine particles dispersed in liquid (sol) agglomerate together to form a continuous three-dimensional network extending throughout the liquid (gel). The resulting nano porous polybenzoxazine provided high porosity and high surface area. In addition, the electron pairs of nitrogen atom in the main chain which can form a dipole-dipole interaction with divalent metals. Therefore, nano porous polybenzoxazine was used as an anti-fouling adsorbent for water treatment. FT-IR was used to confirm the synthesis of polybenzoxazine. The thermal properties such as degradation temperature, % weight loss and curing temperature were investigated by using TG/DTA and DSC, respectively. The adsorption experiments were studied by Atomic Adsorption Spectroscopy (AAS) to investigate the percent of metals removal. A batch equilibrium technique was carried out under the influence of pH, contact time, amounts of adsorbent, including the effect of pore characteristics. In addition, the metal adsorption efficiency of nanoporous polybenzoxazine, carbon xerogels and commercial activated carbon were compared.

Biography

Chanapon Pongteeraporn is a second-year master's degree polymer science student at the petroleum and petrochemical college, Chulalongkorn University. He has received a bachelor's degree of engineering in a petrochemical and polymeric materials. His work related to nanoporous materials, nanotechnology and polybenzoxazine.

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