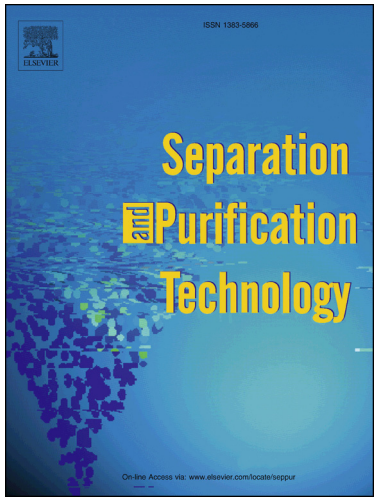

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Efficient removal of Pb(II) by amine functionalized porous organic polymer through post-synthetic modification

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Abstract: Porous organic polymers (POPs), a new class of porous materials constructed by organic molecular building blocks, have attracted much attention. To design POPs with both good porosity and specific-task functionalization is still a critical challenge. In this work, using a simple Friedel-Crafts one-step reaction, one of the most common organic compound methylbenzene monomers were polymerized through the cross-linker formaldehyde dimethyl acetal (FDA) to produce a cost-effective non-functionalized porous polymer (POP-CH_3). Moreover, amine groups were further incorporated into the network by the post-synthetic modification method. The resulted porous polymer POP-NH_2 presented highly effective in removing Pb(II) from aqueous solution. The maximum Pb(II) adsorption capacity, q_{max}, evaluated from the Langmuir model was 523.6 $mg \cdot g^{-1}$. The combination of FT-IR experimental results and the theoretical quantum calculations illustrated that the amine groups (-NH_2) can easily form coordination complexes with Pb(II), which were responsible for efficient adsorption. The generated POP-NH_2 could be regenerated effectively and recycled at least four times without significant loss of adsorption efficiency. Hence, the outstanding Pb(II) adsorption capacity, excellent reusability as well as low cost of synthesis create potential polymer POP-NH_2 to be an attractive adsorbent for removing toxic metal ions from aqueous solution.

Keywords: porous organic polymer;Pb(II);adsorption;theoretical calculations;reusability