Contribution ID: **161** Type: **Poster**

FAST ADSORPTION OF COPPER IONS USING MESOPOROUS SILICA FUNCTIONALIZED WITH THIOL AND AMINO GROUPS

Mesoporous materials have the potential to be used in various areas, such as catalysis, adsorption of contaminating agents, controlled release of drugs, among others. In this work, the synthesis of mesoporous silica functionalized with thiol groups and amino groups is reported. Mesoporous silica was synthesized using the sol-gel method; tetraethyl orthosilicate (TEOS) was used as a precursor and pluronic P123 as a surfactant at concentrations of 1, 2 and 4%. The material obtained was functionalized by the grafting method; (3-mercaptopropyl)trimethoxysilane and (3-aminopropyl)trimethoxysilane were used as precursors of thiol and amino groups, respectively. The synthesis of an amorphous silica was confirmed by X-ray diffraction. Fourier transform infrared spectroscopy showed that thiol and amino functional groups are present in mesoporous silica, with absorption bands at 2565 cm-1 and 1567 cm-1, respectively. By SEM, the morphology of the mesoporous silica reveled, structures of 3 μm in the form of corrugated tubes, after functionalization with MPTMS and APTMS, were found structures of 4 μm long tubes and 4 μm diameter spheres were observed, respectively. Finally, the pore size of each sample was determined using the BET technique. Mesoporous silica functionalized with thiol and amino groups was used in the removal of Cu2+ ions by performing adsorption experiments. Metal quantification was performed using atomic absorption spectroscopy; the data were fitted to the Langmuir and Freundlich isotherms. It was found that mesoporous silica functionalized with amino groups has greater adsorption capacity, since it removed up to 99.7% of the Cu2+ ions.

Keywords

Mesoporous silica, adsorption, copper

Reference

Houmei Liu, Hui Yu, Pian Jin, Preparation of mesoporous silica materials functionalized with various amino-ligands and investigation of adsorption performances on aromatic acids, Chemical Engineering Journal. 379 (2020) 122405. https://doi.org/10.1016/j.cej.2019.122405.

This work was supported by

This work was supported by Vicerrectoría de Investigación y Estudios de Posgrado of the Benemérita Universidad Autónoma de Puebla, México

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Session Classification: NANOSTRUCTURES

Track Classification: Nanostructures