

Synthesis Of Sol-Gel Silica Chemically Bonded With Cyanex 272 For The Removal Of Cu(II), Ni(II), And Zn(II)

Abstract

This article reported on the synthesis of SSCBB, a new solid-phase, sol-gel silica chemically bonded with [bis (2,4,4-trimethylpentyl) phosphinate], (BTMPP, anion of Cyanex 272) prepared with a sol-gel method, and its application as a reusable solid-phase sorbent for the selective removal of Cu(II), Ni(II), and Zn(II). The synthesized SSCBB was characterized by FTIR, EDX, SEM, BET, TGA, and DSC. To evaluate its extraction performance, various parameters such as equilibration time, pH of the aqueous phase, solid to liquid ratio, initial copper ion concentration and reusability of SSCBB were studied. Equilibrium time was found to be 60 min for all metals and almost 100% extraction occurred at a pH of 4.0, 6.0, and 8.8 for Zn(II), Cu(II), and Ni(II) extraction, respectively. The maximum extraction capacity was found to be 0.2 mmol of Cu(II) per gram of SSCBB. Moreover, it was also regenerated and reused for subsequent recovery in ten cycles. The uptake performance of regenerated SSCBB after ten regeneration cycles was found to be the same as the freshly prepared SSCBB. Finally, based on the results, a proposed flow sheet for the removal of Cu(II), Ni(II), and Zn(II) was provided.