

ABSTRACT

The synthesis and sulphonation of mesoporous silica (MS) using a cetyltrimethylammonium bromide (CTAB) template were successfully achieved, resulting in improved Cr(VI) ion adsorption. The synthesis was confirmed through FTIR and SEM-EDX analyses, which verified the mesoporous structure and incorporation of sulphonate groups. In addition to characterisation by Gas Sorption Analysis (GSA), the sol-gel method and sulphonation reflux process were employed. Adsorption efficiency was assessed under varying concentrations, pH levels, and contact times, with the optimal conditions found at pH 2, a contact time of 90 minutes, and 10 ppm Cr(VI). Sulphonated silica (SSCTAB) achieved a Cr(VI) removal efficiency of 94.702%, significantly surpassing that of furnace silica (SCTAB). These results indicate that sulphonated mesoporous silica is highly effective for Cr(VI) ion removal.

Keywords: Mesoporous silica, Sulfonation, Chromium adsorption, Sol-gel, CTAB Template

ABSTRAK

Sintesis dan sulfonasi silika mesopori (MS) menggunakan templat cetyltrimethylammonium bromide (CTAB) telah berhasil dilakukan, sehingga menghasilkan adsorpsi ion Cr(VI) yang lebih baik. Sintesis ini dikonfirmasi melalui analisis FTIR dan SEM-EDX, yang memverifikasi struktur mesopori dan penggabungan gugus sulfonat. Selain karakterisasi dengan Gas Sorption Analysis (GSA), metode sol-gel dan proses refluks sulfonasi juga digunakan. Efisiensi adsorpsi dinilai pada berbagai konsentrasi, tingkat pH, dan waktu kontak, dengan kondisi optimal ditemukan pada pH 2, waktu kontak 90 menit, dan 10 ppm Cr (VI). Silika tersulfonasi (SSCTAB) mencapai efisiensi penyisihan Cr (VI) sebesar 94,702%, secara signifikan melampaui silika bakar (SCTAB). Hasil ini menunjukkan bahwa silika mesopori tersulfonasi sangat efektif untuk menghilangkan ion Cr(VI).

Kata kunci: Silika mesopori, Sulfonasi, Adsorpsi kromium, Sol-gel, Template CTAB