



Sorption of uranyl ions on organosepiolite

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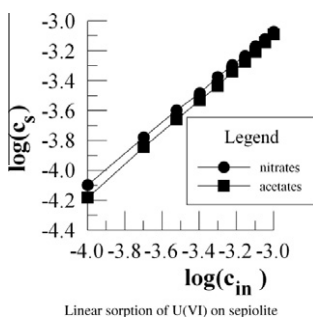
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HIGHLIGHTS

- ▶ HDTMA-sepiolite is found to be efficient sorbent for U(VI) acetates/nitrates.
- ▶ The linear increase of U(VI) sorption with its concentration is evident.
- ▶ The maximum of U(VI) sorption percentage P near 90% appears at $pH > 9$.
- ▶ Solid/liquid ratio $S = 1$ is sufficient for effective U(VI) removal.

GRAPHICAL ABSTRACT



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ABSTRACT

Sorption of U(VI) on sepiolite and HDTMA-sepiolite was studied by investigating sorption isotherms and the influence of pH on sorption percentage P for initial U(VI) concentrations of 0.0001–0.001 mol/dm³. Sorption isotherms were linear both for nitrates and acetate solutions, which was explained as a consequence of the precipitation of U(VI) hydroxycomplexes on the surface of the mineral. $pH > 9$ was optimal for U(VI) sorption on HDTMA-sepiolite, and this fact was related to the sorption of U(VI) anionic complexes on the positively charged surface of the sorbent. The respective chemical reactions for the sorption of different species were proposed.

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1. Introduction

Sepiolite is a porous magnesium silicate which, owing to the presence of channels in its structure, has a high specific surface area. There are many reports concerning the application of sepiolite in the removal of different inorganic and organic impurities from aqueous solutions [1]. Zhou studied sorption by sepiolite of heavy metals (Cu^{2+} , Pb^{2+} , Zn^{2+} and Cd^{2+}) from simulated metallurgical wastewater under different adsorbent dosage, pH, adsorption time and temperature conditions. That author found that the adsorption increased with the adsorbent dosage. At pH 6, the

adsorption of heavy metal ions by sepiolite was in the order $Cu^{2+} > Zn^{2+} > Pb^{2+} > Cd^{2+}$ [2]. Brigatti and coworkers investigated the interaction between sepiolite and Zn^{2+} and Pb^{2+} ions [3]. The release of these ions to the aqueous phase depended on the adsorptive site. The ions were relatively weakly bound within structural channels and on the surface of sepiolite, but strongly bound within the octaheders on the edges of the channels. Bektas and co-workers studied Pb^{2+} sorption on zeolite using the Langmuir and Freundlich models [4]. Enthalpy changes of the adsorption process indicated its endothermic character. Celis et al. [5] used sepiolite modified with thiol groups for the adsorption of Hg(II), Pb(II) and Zn(II).

Among studies of adsorption of organic substances on sepiolite [6–13], the most important is the work of Sabah and Majdan [13] concerning chlorophyll from rapeseed oil. The author found that

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