

SORPTION OF AS(V) ON TREATED AND UNTREATED CLAY MINERALS

DOUŠOVÁ, B.,¹ KOLOUŠEK, D.,¹ MARTAUS, A.,¹ FUITOVÁ, L.,¹ MACHOVIČ, V.,² GRYGAR, T.³

¹ Department of Solid State Chemistry, Institute of Chemical Technology [Ústav chemie pevných látek, Vysoká škola chemicko-technologická], Technická 5, Praha, 166 28, Czech Republic

² Institute of Chemical Technology AS CR [Vysoká škola chemicko-technologická AV ČR], Technická 5, Praha, 166 28, Czech Republic

³ Institute of Inorganic Chemistry AS CR [Ústav anorganické chemie AV ČR], Řež, 250 68, Czech Republic

E-mail: Barbora.Dousova@vscht.cz

The adsorption of arsenic on clay surfaces is very important for the natural and simulated removal of arsenic species from aqueous environment. In this investigation four samples of clay minerals (natural kaolin and metakaolin from the same region, natural clinoptilolite-rich tuff and synthetic zeolite) in both untreated and treated forms were used for the sorption of arsenate from model aqueous solution. The treatment of minerals consisted of exposing them to concentrated solution of Fe(II). Within this process the mineral surface has been probably laden with Fe(III) (oxidohydr)oxides whose high affinity for the As(V) adsorption is well known. Two of the used mineral samples (natural clinoptilolite-rich tuff and synthetic zeolite) were also activated by HCl solution. This treatment suggested the increase of Si–Al ratio due to the dealumination and the removal of carbonates in the water washing stage after HCl treatment.

In all investigated systems the efficiency of As(V) sorption increased significantly with the use of the Fe(II) treated sorbents (from about 15% to more than 90%, Fig. 1), while the acid activation slightly improved only the sorption capacity of synthetic zeolite (to about 60%, Fig. 2).

The mechanism of treating process via Fe(III) laden surface was confirmed by voltametric analysis and diffuse reflectance spectroscopy. The investigation of untreated and treated sorbents indicated the presence of free Fe³⁺ ions or ferrihydrite in the treated samples. IR spectra of treated solids corresponded well to the above mentioned results showing significant bands caused by Fe(III)-SO₄, Fe(III)-O and As-O vibrations. In untreated solids no significant As-O vibrations were observed due to the negligible content of sorbed arsenate.

Acknowledgements

This work was supported by Grant Agency of Czech Republic (project no. 103-03-0506).

References

DOUŠOVÁ, B., MACHOVIČ, V., KOLOUŠEK, D., KOVANDA, F., DORNIČÁK, V. (2003): *Water, Air and Soil Pollution*, **149**, 251–267.

ELIZALDE-GONZÁLEZ, M. P., MATTUSCH, J., WENNRICH, R., MORGENSTERN, P. (2001): *Microporous and Mesoporous Materials*, **46**, 277–286.

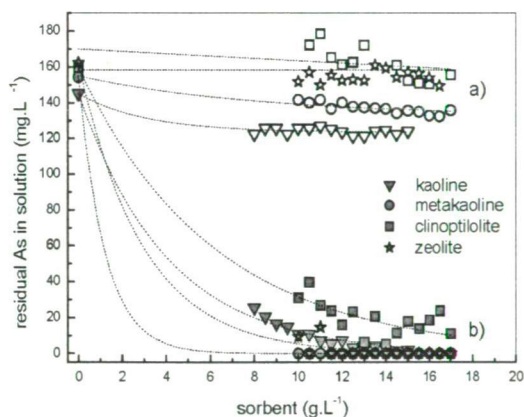


Fig. 1: As sorption with the use of the Fe(II) treatment; a) untreated sorbents (empty symbols), b) treated sorbents (full symbols)

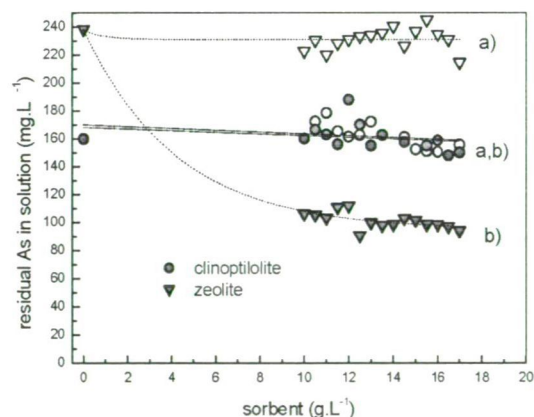


Fig. 2: As sorption with the use of the HCl activation; a) untreated sorbents (empty symbols), b) treated sorbents (full symbols)