Environmental Engineering and Management Journal *March/April 2008, Vol.7, No.2, 149-161*
http://omicron.ch.tuiasi.ro/EEMJ/

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SURFACTANT-MODIFIED NATURAL ZEOLITES FOR ENVIRONMENTAL APPLICATIONS IN WATER PURIFICATION

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Abstract

This paper presents an overview of research related to use of surfactant modified natural zeolites (SMZ) in water and wastewater treatment. The most common natural zeolite, widely used as starting material is clinoptilolite, but other natural zeolites have also been used (chabasite, heulandite, mordenite). In the first part, the preparation methods and the influence of process parameters on the final product properties is reviewed. The discussion is focused on the influence of surfactant concentration in the water phase related to the external cation exchange capacity of the zeolite. The physical-chemical characterization of raw and modified zeolites by using relevant analytical methods (XRD, SEM, thermal analysis, FTIR spectroscopy, DRIFTS) is also presented. Thus, an integrated view of the relation between the structure and the behavior of the modified-zeolites, covering both the compositional and the structural aspects, can be obtained. Following surfactant modification process, the chemistry of zeolite surface is greatly changed, allowing zeolites to sorb not only cations and polar organics but also nonpolar organics and anions, for which untreated zeolites have little or no affinity. Consequently, the area of application of natural zeolites in water and wastewater treatment is greatly extended.
The most relevant applications of surfactant-modified zeolites for the removal of anionic (chromate, phosphate, arsenate), cationic (mercury, cadmium), organic pollutants (BTEX, chlorophenol, perchloroethylene, fulvic acids, dyes, pesticides, ionisable organic solutes, PAHs) and microorganisms are reviewed.
The data reported in the literature suggest that naturally occurring zeolites modified with cationic surfactants can be considered as potential sorbents for the removal of the most important categories of pollutants from polluted waters.

Key words: surfactant-modified zeolites, adsorption, water treatment, regeneration

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