

Characterization of natural silicate minerals utilised in environmental applications

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Abstract

Natural minerals are widely used in numerous applications, such as sorbents in ion exchange and sorption processes. Minerals such as zeolites and clays can be found all over the world, but they are mined containing a variety of different impurities, which renders their thorough characterization prior to utilization necessary. In the present study, an excessive literature review on three common natural silicate minerals used in several applications - one zeolite (clinoptilolite) and two clays (bentonite and vermiculite) - has been conducted and the relevant results and methods have been comparatively reported in this paper. The study is complemented by a set of characterization analyses by means of X-Ray Diffraction (XRD, 27 samples), X-Ray Fluorescence (XRF, 39 samples), Fourier transform infrared (FTIR, 29 samples) spectroscopy, Thermo-Gravimetric Analysis (TG/DTG/DTA, 48 samples), N₂-porosimetry (BET, 19 samples), and Scanning Electron Microscopy (SEM).

Key Words: Natural minerals, bentonite, vermiculite, clinoptilolite, characterization, ion exchange