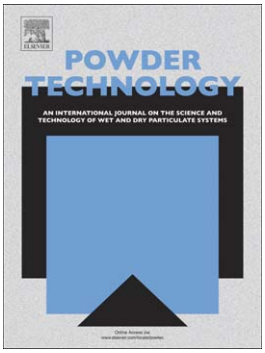

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ABSTRACT

Natural zeolite is considered to be an effective and economical crystalline aluminosilicate adsorbent and catalyst. In the treatment of coal seam gas (CSG) co-produced water, it has the potential to become an economic alternative filtration medium for the reduction of excessive Na content. A variety of methods for the modification of natural zeolite have been used to improve its surface properties. This study reports the results of X-ray photoelectron spectroscopy (XPS) analysis on the near-surface of natural zeolite (clinoptilolite and quartz) particles before and after modification by sulphuric acid. The atomic % and binding energies of the chemical elements comprising zeolite are changed significantly following acid treatment. With increasing sulphuric acid concentration, the Si/Al atomic ratio increases from 2.99 at 0 M to 4.92 at 5 M. The binding energy (BE) shifts show a similar trend with increasing acid concentration. High-resolution and valence band spectra show that the BE shifts are influenced by cation removal from the zeolite structure. These detailed XPS results are useful for understanding changes in the sodium adsorption capacity of zeolite by acid modification to enhance its suitability for use in treatment of CSG co-produced water.

Key words: zeolite, acid treatment, XPS, binding energy, valence band