

Poster Presentation

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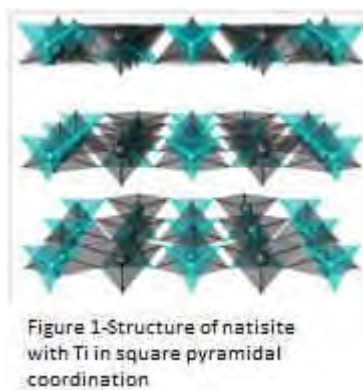
EXAFS studies of the metal coordination environments in mixed Ti/Zr silicates

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Microporous materials have a wide range of commercial uses from ion-exchangers to catalysts and have been used in the treatment of nuclear waste. The acidity associated with legacy waste pools often limits the effectiveness of these zeolites due to a loss of crystallinity. Microporous titanium silicates display different structural characteristics compared to conventional zeolites. Sitenakite, $\text{KNa}_2\text{Ti}_4\text{Si}_2\text{O}_{13}(\text{OH})\cdot 4\text{H}_2\text{O}$ and the synthetic niobium doped analogue are being used as ion-exchange materials for the removal of Cs^+ and Sr^{2+} from nuclear waste. Natisite is a layered titanium silicate with titanium in an unusual 5 coordinate square pyramidal environment. Natisite, $\text{Na}_2\text{TiSiO}_5$, crystallises in the tetragonal space group $P4/nmm$. [1, 2] A series of samples have been prepared with varying levels of zirconium doping ranging from 10% to 50%. Powder x-ray diffraction (PXRD) showed no obvious impurities attributed to zirconium containing phase. X-Ray Fluorescence (XRF) was carried out and showed the presence of zirconium indicating that doping had been successful. Ion-exchange experiments were carried out on the doped and undoped natisite samples using Cs and Co containing solutions. It was found that increasing the levels of zirconium increased the affinity towards Cs with the undoped materials taking up very little Cs. The rate of exchange with Co seemed to increase as the zirconium level was increased within the sample. This suggests that the presence of zirconium in the framework has a considerable effect on the ion-exchange properties of natisite. EXAFS has been useful in determining the coordination environment of titanium and zirconium in order to help fully understand the chemistry of this material. Also it has helped with determining if the exchanged Cs and Co have a preference for the sites close to Zr rather than Ti. It is therefore believed that the inclusion of zirconium in the natisite framework has potential use as an ion-exchanger in the nuclear industry.

[1] D. Medvedev, A. Tripathi et al., *Chem. Mater.*, 2004, 16, 3659, [2] S. Ferdov, V. Kostov-Kytin et al., *Powder Diffraction*, 2002, 17, 234



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