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Synthesis and characterization of iron doped sodium and potassium titanates using the Pechini sol-gel method

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Iron doped (FE:5Ti) sodium and (FE:10Ti) potassium titanates were prepared by the Pechini sol-gel method and calcined at 800 . X-ray diffraction (XRD), Scanning electron microscopy (SEM), Transmission Electron Microscopy (TEM), Energy Dispersive X-ray spectrometry (EDS), FTIR and Raman spectroscopy were used to characterize the titanate nanomaterials. A quantitative XRD analysis using Rietveld refinement of the titanates confirmed the powders to consist of crystalline phases with the Na2Ti7O15 and K2Ti8O17 phases predominant for the sodium and potassium titanate, respectively. This was further confirmed using selected area electron diffraction (SAED) in the TEM. SEM analysis indicated the titanates consistent with a nanostructured material exhibiting rod like morphology. The elemental compositions of the titanites were examined by SEM-EDS and TEM-EDS and found to agree well with the targeted Fe to Ti ratio from synthesis. Limited evidence for the segregation of iron in the titanate regions were found indicating the iron to be incorporated within the titanate lattice. Electron energy loss spectroscopy (EELS) fine-structure analysis of the Fe L2,3 core-loss edge was successfully used to match the Fe to a 3+ or 4+ valence state. Finally, Fourier transform infrared spectroscopy (FTIR) was used to classify the stretching and bending vibration modes of the functional group of sodium and potassium titanates along with Raman spectroscopy.

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Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

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