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Enhanced structural and spectroscopic properties of phosphosilicate nanostructures by doping with Al_2O_3 ions and calcinations temperature

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Abstract : In the present work, Al_2O_3 doped (80 P_2O_5: 20 SiO_2) nanostructures were successfully prepared using a sol–gel process using triethyphosphate and tetraethylorthosilicate. We investigated the phase structure, microstructure and spectroscopic properties. Three different solutions were prepared by changing Al/P molar ratios such as 0, 10 and 15 in acidic condition. The obtained gel were aged at room temperature and dried at 100°C forming xerogel and subsequently calcined at different temperatures from 100 up to 700°C for 3h in air. The obtained oxides were characterized using X-ray diffraction (XRD), scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR). The micro-structural observations demonstrated that Al_2O_3 content improved surface morphology of the nanostructure phosphosilicate. X-ray diffraction and FT-IR showed that the addition of Al_2O_3 caused the formation of phosphosilicate network as P–O–Si, and formation of mixed phases based on P–O–Si–O–Al and P–O–Al separated from the phosphate matrix.
Keywords: Sol gel processes, phosphosilicate glass, aluminophosphosilicate nanoparticles, XRD, FTIR.

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