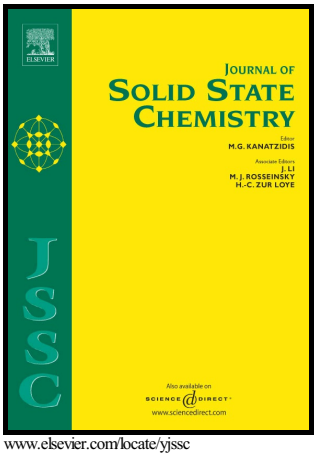

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Formation of discrete β-$Ca_3(PO_4)_2$-Y_2O_3 phase mixtures influenced through elevated heat treatments

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Abstract

The possibility to attain a discrete β-tricalcium phosphate (β-$Ca_3(PO_4)_2$)/yttria (Y_2O_3) composites starting from the solution based precursors were deliberated. The sequential steps of calcination temperature and the associated phase changes to yield a pure form of β-$Ca_3(PO_4)_2$/Y_2O_3 were elaborated through a wide range of analytical techniques. Alteration in the precursor concentrations yielded β-$Ca_3(PO_4)_2$/Y_2O_3 composite with a wide range of individual compositional ratios. The advanced crystallization of Y_2O_3 is evident whereas the delayed formation of β-$Ca_3(PO_4)_2$ is mainly contributed by the sluggish phase transition of calcium deficient apatite. The formation of pure β-$Ca_3(PO_4)_2$/Y_2O_3 composite is attained only at 1500 °C, where Y^{3+} prefers accommodation at the Ca^{2+}(1), Ca^{2+}(2) and Ca^{2+}(3) sites of β-$Ca_3(PO_4)_2$ structure. The selective mechanical properties determined from the indentation technique implied a detrimental role of Y_2O_3 in the resultant mechanical data of β-$Ca_3(PO_4)_2$/Y_2O_3 composites.