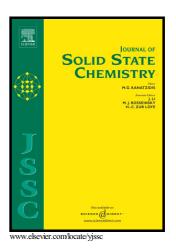
### Author's Accepted Manuscript

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#### **ACCEPTED MANUSCRIPT**

# Formation of discrete $\beta$ -Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>-Y<sub>2</sub>O<sub>3</sub> phase mixtures influenced through

#### elevated heat treatments

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#### **Abstract**

The possibility to attain a discrete  $\beta$ -tricalcium phosphate ( $\beta$ -Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>)/yttria (Y<sub>2</sub>O<sub>3</sub>) 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  $\beta$ -Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>/Y<sub>2</sub>O<sub>3</sub> were elaborated through a wide range of analytical techniques. Alteration in the precursor concentrations yielded  $\beta$ -Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>/Y<sub>2</sub>O<sub>3</sub> composite with a wide range of individual compositional ratios. The advanced crystallization of Y<sub>2</sub>O<sub>3</sub> is evident whereas the delayed formation of  $\beta$ -Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> is mainly contributed by the sluggish phase transition of calcium deficient apatite. The formation of pure  $\beta$ -Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>/Y<sub>2</sub>O<sub>3</sub> composite is attained only at 1500 °C, where Y<sup>3+</sup> prefers accommodation at the Ca<sup>2+</sup>(1), Ca<sup>2+</sup>(2) and Ca<sup>2+</sup>(3) sites of  $\beta$ -Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> structure. The selective mechanical properties determined from the indentation technique implied a detrimental role of Y<sub>2</sub>O<sub>3</sub> in the resultant mechanical data of  $\beta$ -Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>/Y<sub>2</sub>O<sub>3</sub> composites.

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