

### Iron substituted Ca-Sr-Ba- Apatites: Preliminary Results

Gabriella Salviulo<sup>a</sup>, A. Speghini<sup>b</sup>, M. Bettinelli<sup>b</sup>, L. Nodari<sup>c</sup>, U. Russo<sup>c</sup>, <sup>a</sup>*Dip. Mineral. Petrol. Univ. Padova.* <sup>b</sup>*DST, Univ. Verona,* <sup>c</sup>*Dip. Sci. chim. Univ. Padova.* E-mail: gabriella.salviulo@unipd.it

The aim of this work is the characterization of Fe-substituted Ca-Sr-Ba-hydroxyapatite of composition  $[(\text{Me}_{10-x}\text{Fe}_x)(\text{PO}_4)_6(\text{OH})_y]$ , where  $x = 0.0; 0.05; 0.1; 0.5; 1.0; 1.5$  obtained by high temperature solid state reaction. Stoichiometric quantities of the appropriate metal carbonate, iron (III) oxide and ammonium hydrogen phosphate were mixed in an agata mortar and pressed with a hydraulic press to form pellets subsequently heat treated at 1200 °C ( $x=0.05, 0.1, 0.5$  and 1.0) for 72 hours or at 1450 °C ( $x=1.5$ ) for 48 hours. The heat treatment was repeated two more times with intermediate grinding. For the most diluted samples <sup>57</sup>Fe isotopically enriched iron (III) oxide was used. The X-ray diffraction patterns show sharp and narrow apatite peaks, however none of these powders is constituted by only one crystalline phase. All samples show the presence of hydroxyapatite and/or triphosphate, the relative amounts depending on the theoretical composition. For all the series, hydroxyapatite is the dominant phase for  $\text{Fe} \leq 0.1\%$  (higher than 60%), and is absent for  $\text{Fe} \geq 1\%$ . It is emphasized that the composition  $\text{Fe} = 0.5\%$  is crucial: because Ca- and Sr- samples are a mixture of apatite and triphosphate, while Ba-sample is 100% barium triphosphate. The accurate cell constant determination allows some considerations about  $a$  and  $c$  parameters dependence on chemical composition. Preliminary Mössbauer results indicate the presence of oxidic iron species and of substituted hydroxyapatite and phosphate in amounts that are function of both the iron amount in the starting material and the type of cation, in agreement with the X-ray powder diffraction data.

**Keywords:** apatites, Mössbauer, x-ray diffraction