

Synthesis, Structural and Vibrational Studies of a New Lacunar Apatite: LiPb₂Ca₂(PO₄)₃

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Abstract : The phosphate is a natural resource of great importance in Morocco. In order to exploit this wealth, synthesis and studies of new a material based phosphate, were carried out. The apatite structure present o lot of characteristics, One of the main characteristics is to allow large and various substitutions for both cations and anions. Beside their biological importance in hard tissue (bone and teeth), apatites have been extensively studied for their potential use as fluorescent lamp phosphors or laser host materials. The apatite have interesting possible application fields such as in medicine as materials of bone filling, coating of dental implants, agro chemicals as artificial fertilizers. The LiPb₂Ca₂(PO₄)₃ was synthesized by the solid-state method, its crystal structure was investigated by Rietveld analysis using XRPD data. This material crystallizes with a structure of lacunar apatite anion deficit. The LiPb₂Ca₂(PO₄)₃ is hexagonal apatite at room temperature, adopting the space group P6₃/m (ITA No. 176), Rietveld refinements showed that the site 4f is shared by three cations Ca, Pb and Li. While the 6h is occupied by the Pb and Li cations. The structure can be described as built up from the PO₄ tetrahedra and the sixfold coordination cavities, which delimit hexagonal tunnels along the c-axis direction. These tunnels are linked by the cations occupying the 4 f sites. Raman and Infrared spectroscopy analyses were carried out. The observed frequencies were assigned and discussed on the basis of unit-cell group analysis and by comparison to other apatite-type materials.

Keywords : apatite, Lacunar, crystal structure, Rietveldmethod, LiPb₂Ca₂(PO₄)₃, Phase transition

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020