

Synthesis of Sr:LaPO₄ nanometric powders by a co-precipitation method

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Abstract

A co-precipitation method was used to obtain La_(1-x)Sr_xPO₄ (x = 0, 0.025, 0.05, 0.1) powders by means of the following precursors: La(NO₃)₃ · 6 H₂O, Sr(NO₃)₂ and (NH₄)₂HPO₄. Several analysis methods were applied in order to understand the structure and the morphology of the powders at different doping percentages and calcination temperatures up to 800C. The average agglomerate size of the powders was found to be between 0.1 and 100 μm by means of laser-particle-size analysis and confirmed by SEM micrographs. X-Ray diffraction (XRD) patterns of the as-prepared powders display the typical peaks of phase-pure LaPO₄ (standard ICDD 32-0493 pattern). TGA data of the as-prepared powders exhibit a 20 % weight loss that can be attributed to the residual water and the decomposition of NH₄NO₃ (by-product) up to 250 C. By Infra-red spectroscopy characteristic peaks of rare-earth phosphate can be observed. The presence of NH₄NO₃ is confirmed by DTA data and Nitrogen content analysis. None of the analyses performed showed any significant difference between the Sr-doped and undoped powders. Furthermore, the lattice parameters do not vary with dopant content; this is most likely because Sr and La cations have similar size and Sr atoms occupy the same positions of La atoms in the crystal lattice. Sr:LaPO₄ rod-like crystals were observed by TEM-EDX for the as-prepared powders. The size of the crystals was calculated from XRD data and observed through TEM and was found to be between 5 and 50 nm.