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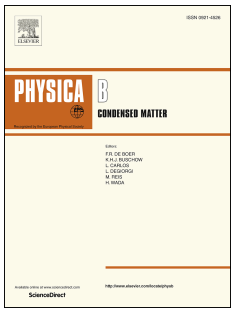

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ACCEPTED MANUSCRIPT

Crystal Growth and Optical Characterization of Chromium-Doped L-arginine Phosphate Monohydrate

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ABSTRACT

L-arginine phosphate monohydrate single crystals doped with Cr^{3+} ions (LAP:Cr) were grown by slow cooling method, with dimensions up to 10x10x8 mm^3. Chromium ions induce a drastic reduction of overall growth rate and produce a drastic change in LAP growth morphology. The functional groups of LAP:Cr crystals were confirmed by FTIR analysis and compared with pure LAP. The optical band gap of LAP:Cr was determined from UV-VIS-NIR transmittance spectrum. Optical absorption spectrum at room temperature and 10 K was measured consisting of two large bands due to the $^4A_2 \rightarrow {}^4T_2$ and $^4A_2 \rightarrow {}^4T_1$ transitions and a narrower band attributed to the $^4A_2 \rightarrow {}^2E$ spin-forbidden transition, characteristic of Cr^{3+} ions. Luminescence spectra of pure and Cr^{3+}-doped samples were collected with excitation at wavelength of 350 nm and 335 nm. Emissions from host LAP matrix and Cr^{3+} ions were observed. Excited with 350 nm the spectra reveal a broad intense band from 21000 to 26000 cm^{-1} region due to electronic transition from LAP ligand. The emission spectra of doped sample present two broad bands centered at 12346 cm^{-1} and 13412 cm^{-1} from $^2E \rightarrow {}^4A_2$ and $^4T_2 \rightarrow {}^4A_2$ transitions, characteristics of luminescence from Cr^{3+} ions. From these results the Racah and crystal-field Cr^{3+} parameters were evaluated and comparing with those obtained in similar systems.

Keywords: nonlinear optical crystal; LAP; chromium; luminescence; crystal field

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