

Optical spectroscopy of yttrium double phosphates doped by cerium and praseodymium ions.

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This paper reports the spectroscopic properties of cerium- and praseodymium-doped alkali metal yttrium double phosphates, $M_3Y(PO_4)_2:Pr^{3+}, Ce^{3+}$; $M = Na, Rb$. These phosphates were obtained by a solid state reaction between lanthanide phosphate hydrates and M_3PO_4 . The absorption, reflection, emission and excitation spectra were measured at room temperature, 77 and 4 K in the IR-vis-ultraviolet (UV) range. For both the Ce^{3+} - and Pr^{3+} -doped double phosphates, the $4f^N \leftrightarrow 4f^{N-1}5d$ transitions were detected. For the Pr^{3+} -doped double phosphates, the $4f-4f$ transitions from the ground manifold were analyzed. The low temperature absorption spectra were used to characterize the structural modifications between the sodium and rubidium salts. For the Ce^{3+} -doped double phosphate, the strong blue $5d^1 \rightarrow 4f^1$ emission band splits into two components due to the splitting of the $4f^1$ configuration. Intense emission occurs mainly from the level at high dopant concentrations, since the emission is strongly quenched but was detected at the 2 mol% doping level. In spite of the forbidden $4f-4f$ character, the transitions have very short decay times, of the order of one μs . Dynamics of the excited states will be discussed based on the decay times and selective excited emission.

Słowa kluczowe

Cerium, Praseodymium, Absorption, Emission, Yttrium double phosphates

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