Site-selective emission spectra of Eu^{3+} :$Ca_5(PO_4)_3F$.

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Streszczenie

The room temperature site-selective fluorescence and excitation spectra of Eu3+:FAP powder samples as well as the decay times of the observed emission lines associated with the 5D0→7F0,1,2 transitions have been measured. In sample I, prepared by the thermally stimulated diffusion of Eu2O3 in the solid state, Eu3+ reside only in the Ca(II) location which has Cs symmetry. Experimental values for the Stark energy levels have been determined for three well-separated sites. Sites A and B exhibit very similar spectral features attributed to the presence of the charge-compensating O2− ion in the F− position in the FAP lattice, whereas for Eu3+ in site C the charge is most probably compensated by vacancies according to 3Ca2+→2Eu3++Vacancy substitution. In sample II, prepared by precipitation of Eu3+(1%):FAP from solution, Eu3+ substitute for calcium in the Ca(I) position exclusively and three sites with C3 symmetry have been identified. Substitution of 3Ca2+/2Eu3+ is the most probable charge-compensation mechanism. Heating of sample II stimulates the migration of Eu3+ from the Ca(I) position to the low symmetry Ca(II) site.

Słowa kluczowe

Fluoroapatite, Europium(3+), Site-selective fluorescence spectroscopy

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