Phase Formation and Luminscence of Divalent Europium Doped Alkaline Earth Chlorosilicate

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Alkaline earth chlorosilicate, $(Ca,Sr)_8Mg(SiO_4)_4Cl_2$, is a suitable host for divalent europium and has been proposed as an efficient phosphor emitting in the green spectral range /1,2/.
This paper relates to the phase formation during the solid state reaction under reducing atmospheres and to the luminescence properties of such phosphors. Starting from a mixture of oxides, carbonates and chlorides it is found that the reaction sequence is rather complex. It includes the formation of various pre-phases like tri calcium chlorosilicate and alkaline earth silicates in a temperature range from 500 °C to 900 °C. Single phase $Ca_8Mg(SiO_4)Cl_2$ is obtained at about 1100 °C. However precise control of the reaction atmosphere is necessary to achieve single phase and efficient phosphors. The emission spectrum shows a maximum at about 511 nm while the precise spectral position depends on excitation wavelength and europium content. The quantum efficiency which can reach a value of > 75 % for excitation at wavelengths below 400 nm shows similar dependencies.

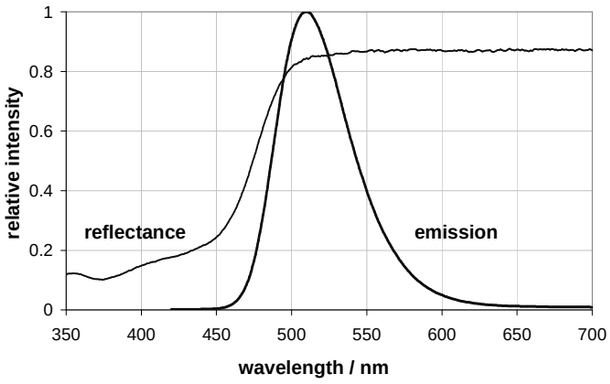

Fig: Reflectance and emission spectra of divalent europium doped alkaline earth chlorosilicate (400 nm excitation)

References:

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