Poster Presentation

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Growth and Characterization of Ce3+ doped Calciumferrate(III) Type Crystals

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Ce3+ ions in oxide hosts show broad optical emission in the green spectral range, because of a strong ligand field. Substances such as Ce3+ doped CaSc2O4 and SrY2O4 crystallizing in the calciumferrate(III) structure type are used as ceramic phosphors for white LED's. However, under ambient conditions cerium prefers the 4-valent state, e.g. CeO2. For the ceramics, charge compensation and incorporation of Ce3+ can be reached by adding alkaline oxides, where e.g. (Na+, Ce3+) are substituting (2 Ca2+). Unfortunately, this option is not feasible for single crystal growth from the melt, because at the very high melting points near 2100°C (CaSc2O4, [1]) or even 2200°C (SrY2O4, [2]) alkaline oxides are evaporating completely. It will be shown that nevertheless efficient Ce3+ doping of both hosts can be obtained if melt crystal growth is performed in a suitable atmosphere with sufficiently low oxygen fugacity. First crystal growth experiments where performed by LHPG (Laser Heated Pedestal Growth), but meanwhile bulk growth by the Czochralski technique is feasible too. The figure shows such Ce3+:CaSc2O4 single crystal. Especially Ce3+:CaSc2O4 shows efficient broad band green emission, and no foreign phases indicating Ce4+ (CeO2) can be detected by X-ray diffraction. TEM analysis hints on incorporation of Ce3+ on a Ca2+ site.

[1] *J. Philippen, C. Guguschev, R. Bertram, D. Klimm, J. Crystal Growth, 2013, 363, 270-276,* ***[2]*** *J. Philippen, C. Guguschev, D. Klimm, http://arxiv.org/abs/1401.7578*

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