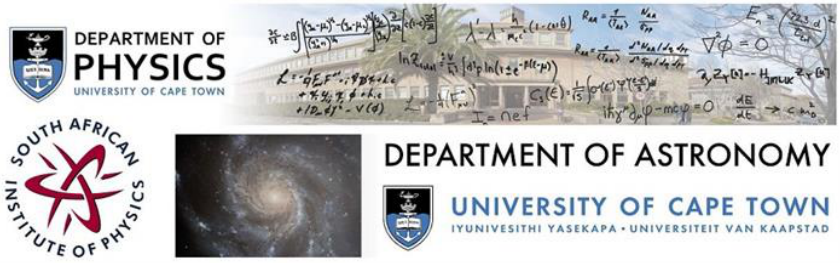

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NIR quantum-cutting OF Pr3+ and Yb3+ Codoped Fluoride crystal

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Abstract content
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A possible quantum cutting process between the Pr3+ and Yb3+ ions in CaF2 was investigated to increase solar cell efficiencies. There are certain phosphor materials that can transform the energy of one absorbed high energy photon into two (or more) emitted low energy photons. This process is known as quantum-cutting (down-conversion) with a quantum efficiency of more than 100 %. The down-conversion materials based fluorides have stood out among other candidates because of their low phonon energy (which reduces the non-radiative electronic relaxation processes). The Pr3+-Yb3+ down-conversion couple in CaF2 materials was synthesised by the co-precipitation method. X-ray diffraction patterns indicate that the samples crystalized completely into the pure face-centred cubic structure (space group: Fm3m). Energy transfer occurred subsequently from Pr3+ to Yb3+ followed by an intense NIR (˜ 1000 nm) emission spectral range. The energy transfer process is indicated by the decrease in the Pr3+ related photoluminescence (PL) and lifetime results with increasing Yb3+ concentration. The energy transfer is completed at a high concentration but the Yb3+ emission intensity decreased as a result of concentration quenching.

Keywords: Quantum-cutting, energy transfer, fluoride material, Pr3+-Yb3+ couple.

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