PHOTOLUMINESCENCE IN SPS-PROCESSED TRANSPARENT CE:YAG CERAMICS

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Ceramic phosphors display great promise for the realization of high-power lighting devices. Cerium-doped yttrium aluminum garnet (Ce:YAG) is commonly used as a phosphor in white light emitting diodes. Therefore, it was chosen as a case study to investigate photoluminescence of transparent ceramic phosphors fabricated by spark plasma sintering (SPS). In the present work, 0.5 at.% Ce:YAG nano-powder was synthesized by a co-precipitation method and subsequently consolidated by SPS into highly transparent ceramic samples. The effect of varying sintering parameters (temperature and pressure) and post-sintering treatments (hot isostatic pressing and air atmosphere thermal treatment) on optical properties was investigated. Correlations between in-line transmittance, photoluminescence (PL) and residual porosity characteristics (pore size and volume fraction) were established. It was also found that PL emission intensity and external quantum efficiency were significantly affected by intentionally created surface roughness.

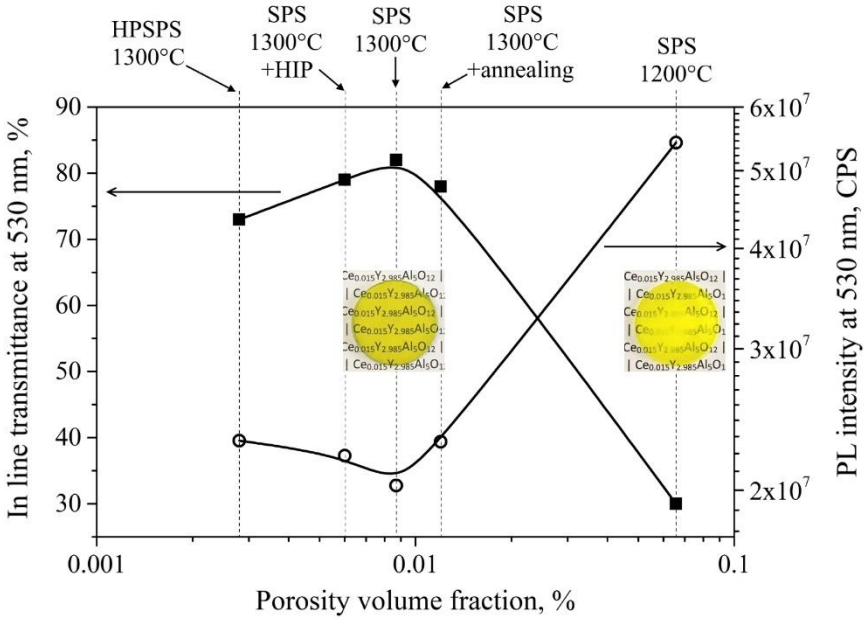

Figure 1- In-line transmittance and PL intensity of 0.5% Ce:YAG as a function of residual porosity volume fraction, inserts of the sintered samples.