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ONE-STEP PHOSPHOR IN GLASS SYNTHESIS AND CHARACTERIZATION

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As a solid-state lighting source, LEDs have been phasing-out incandescent and fluorescent lamps since the improvement of blue LEDs and white LED commercialization in 1996 [1]. Currently to produce white light, blue LEDs are combined with a yellow YAG:Ce^{3+} phosphor which is dispersed in silicone or other organic resin. However, to use them in in high brightness applications, high current densities are needed to generate high intensity emission in LEDs. Past a certain point, the amount of generated light drops due to so called efficiency droop phenomena [2]. To circumvent the need for increased current densities, a larger amount of LEDs are used instead. As the junction temperature increases, currently used silicone suffers from color shifting, and luminous efficiency degradation with prolonged use [3]. One of the means to improve thermal conductivity of phosphor plates, allowing higher LED operating temperature range, is to disperse phosphors in glass, ceramic or glass-ceramic matrices [4].

In this work phosphate glasses with different compositions were synthesized. The glass precursors and luminescent materials were ground and mixed together, melted in muffle furnace: molten liquid was poured into premade molds and heated again at lower temperatures to relieve thermal stress. As obtained samples were polished and characterized by x-ray diffractometry, photoluminescence measurements and inductively coupled plasma optical emission spectrometry.

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