STANDARD OF UP-CONVERSION LUMINESCENCE BASED ON SINGLE CRYSTALS OF ALCALINE EARTH FLUORIDES DOPED WITH YTTERBIUM AND ERBIUM/THULIUM/HOLMIUM

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Up-conversion fluoride powder luminophores with different morphology and core-shell architecture have great interest for bioimaging, plastic sorting, increasing efficiency of solar cells, anti-counterfeiting, thermometry, vacuummetry, and biophotonics. Measurements of absolute photoluminescence quantum yield in an integrating sphere (A-PLQY) for dispersions or particles are very complicated task. One of the solutions is the registration of relative photoluminescence quantum yield (R-PLQY) without an integrating sphere by means of luminescence standard. The ideal object for the luminescence standard is a single crystal that has a maximum volume to surface ratio.

The goal of the study is the determination of single crystal composition with the highest A-PLQY and its examination as the standard of up-conversion luminescence.

The single crystals of binary and ternary solid solutions (MF_2:Yb:R, M=Ca, Sr, Ba, Pb; R = Tm, Ho, Er) were grown by the Bridgman technique in a vacuum furnace with CF_4 fluorinating atmosphere. The compositions with highest value of up-conversion quantum yields were determined.

The optimized single crystals were succulently testified as standard materials for determination of nanoparticle R-PLQY.

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