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NEW GREEN EMISSION IN Ce^{3+} DOPED YTTRIUM ALUMINIUM PEROVSKITE

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Optical properties of Ce^{3+} in yttrium aluminium perovskite (YAlO_3) are known in the VUV, UV and visible ranges in detail [1-3]. There were studied emission properties of several Ce^{3+} , ($\text{Ce}^{3+}, \text{Nd}^{3+}$) and ($\text{Ce}^{3+}, \text{Nd}^{3+}, \text{Cr}^{3+}$) doped YAlO_3 crystals ($4f \rightleftharpoons 5d$ transitions) together with transfer processes between various Ce^{3+} multisites under hydrogen lamp excitation on the spectrofluorometer Model 199 S Edinburgh Instruments in the UV and visible ranges in this paper..

New $\text{Ce}^{3+}5d \rightarrow 4f$ emission band was observed on lightly ($\sim$ ppm) and heavily (~ 0.5 at. %) Ce^{3+} doped YAlO_3 crystals for the first time. This emission band is broad (from 450 to 550 nm), peaking at 500 nm at room temperature and its intensity increases with Ce^{3+} content. The fluorescence decay measurements show that it is caused by Ce^{3+} ions in YAlO_3 because its fluorescence lifetime is $\tau \approx 14$ ns which is much shorter than Ce^{3+} fluorescence lifetime in $\text{Y}_3\text{Al}_5\text{O}_{12}:\text{Ce}$ where $\tau \approx 60$ ns. The Ce^{3+} green emission band disappears in $\text{YAlO}_3:\text{Ce}$ crystals codoped with Nd and Cr.

From spectroscopic measurements the energy level scheme of new Ce^{3+} centres in YAlO_3 crystals was determined. Generally, we can resolve two Ce^{3+} multisites in YAlO_3 from which the first one is radiating in the UV (major centres) and the second one in the green (minor centres). The radiative energy transfer was observed between Ce^{3+} multisites (from $\text{Ce}^{3+}(\text{UV})$ to $\text{Ce}^{3+}(\text{green})$ centres). A structure of the Ce^{3+} multisites will be discussed. The Ce^{3+} multisites responsible for green emission could be caused either due to Ce^{3+} pairs (less probable) or due to Ce^{3+} centres where two Ce^{3+} ions are binded via O^{2-} ions from YAlO_3 lattice (more probable case).

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