Unusual Structural Properties of (Na,Gd,Yb)WO₄ and (Na,La,Ce,Er)MoO₄

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Single crystals of general formula $(Na^{+1}, R^{3+})T^{6+}O_4$ $(R^{3+}=Gd, La; T^{6+}=Mo \ \mu \ W)$, doped by Yb^{3+} , Ce^{3+} , Er^{3+} meet very high interest of different scientific groups as active media for solid-state lasers.

Crystals of $(Na_{0.5}Gd_{0.5-x}Yb_x)WO_4$ with x=0.0, 0.0025, 0.0075, 0.025, 0.10) and $(Na_{0.500}La_{0.495-x}Ce_xEr_{0.005})MoO_4$ with x=0.0, 0.10, 0.125, 0.15, 0.175, 0.20) belonging to sheelite family have been grown by Czochralski technique in a different atmosphere, treated by a different conditions and studied by X-ray diffraction.

The (Na_{0.5}La_{0.5})MoO₄ with $|\Delta r_{(Na-La)}|=r_{Na}-r_{R}=0.02Å$ (r-ionic radius) has the scheelite structure (sp. gr. I4₁/a), in contrast to the (Na_{0.5}Gd_{0.5})WO₄ ($|\Delta r_{(Na-Gd)}|=0.13Å$) and (Na,Gd,Yb)WO₄ ($r_{Na}>r_{Gd}>r_{Yb}$) with the pseudo-tetragonal superstructure unit cell with double parameters. The non-annealed (growth in Ar) and annealed by 1000°C for 4 days in air crystals of (Na_{0.500}La_{0.445}Ce_{0.05}Er_{0.005})MoO₄ nominal composition have "enantiomorphic" structures. The annealed by 1000°C for 24 h in air crystal of (Na_{0.500}La_{0.295}Ce_{0.20}Er_{0.005})MoO₄ has the scheelite structure. A statistical distribution of oxygen on two sites of structure of non-annealed (growth in 99%N₂+1%O₂) and annealed by 700°C for 100 h in air of these crystals was found.

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