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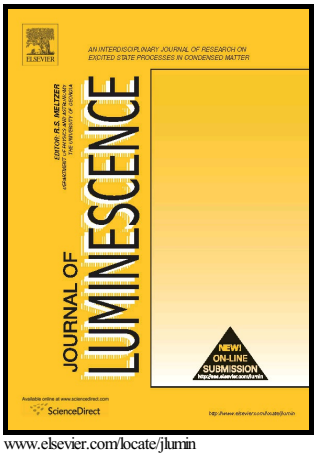

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Growth, spectroscopy and laser operation of Ho:$KY(WO_4)_2$

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Abstract Monoclinic Ho:$KY(WO_4)_2$ crystals doped with up to 7.5 at.% Ho are grown by the Top Seeded Solution Growth-Slow Cooling method. The evolution of their unit cell parameters in dependence on the Ho doping and temperature is studied. The polarized low-temperature (6 K) optical absorption of the Ho^{3+} ion is investigated in detail to determine the energy of the Stark sub-levels. Room-temperature absorption, stimulated-emission and gain cross-section spectra of Ho:$KY(WO_4)_2$ crystals are derived for polarizations parallel to the principal optical axes, $E \parallel N_p$, N_m and N_g. The maximum absorption cross-section for the $^5I_8 \rightarrow {}^5I_7$ transition is 1.60×10^{-20} cm^2 at 1961.0 nm and the maximum stimulated-emission cross-section for the $^5I_7 \rightarrow {}^5I_8$ transition is 2.65×10^{-20} cm^2 at 2056.3 nm (for $E \parallel N_m$). The radiative lifetime of the upper laser level of the Ho^{3+} ion ($^5I_7$) amounts to 4.8 ms. Continuous-wave Ho^{3+} laser operation is achieved under in-band pumping by a Tm laser at 1946 nm. In the microchip configuration, the maximum output power reached 205 mW at 2105 nm with a slope efficiency as high as 85%.

Keywords: Double tungstates, holmium, absorption, stimulated-emission, laser