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Spectroscopic properties and continuous-wave laser operation of Er^{3+}:Yb^{3+}:$LaMgB_5O_{10}$ crystal

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Abstract

A bulk crystal of Er^{3+}:Yb^{3+}:$LaMgB_5O_{10}$ was grown successfully by the top seeded solution growth (TSSG) method. The spectroscopic characterization of this material, including the polarized absorption and fluorescence spectra and the fluorescence decay curve, were recorded. The fluorescence quantum efficiency of the $^4I_{13/2}$ level of Er^{3+} ions and the efficiency of energy transfer from Yb^{3+} to Er^{3+} ions were estimated. Continuous-wave laser output of 160 mW at 1567 nm was realized under the absorbed pump power of 3.1 W in a hemispherical cavity. When the output coupler transmission was 1.7% the absorbed pump threshold was 1.5W and the slope efficiency of the laser was 10.1%. The results show that Er^{3+}:Yb^{3+}:$LaMgB_5O_{10}$ crystal is a promising laser material.

Keywords: Optical materials, Oxide materials, Crystal growth, Optical spectroscopy.