Growth and polarized spectral properties of Tm:$Ca_3TaGa_3Si_2O_{14}$ crystal for mid-infrared laser

Pingzhang Yu[1]*, Zhengping Wang[1], Hongkai Ren[1], Xuezhi Zhao[1], Guowei Liu[1], Haohai Yu[1], Xun Sun[1], Xinguang Xu[1]

*lead presenter: oct753951@163.com

1 State Key Laboratory of Crystal Materials, Shandong University, Jinan 250100, China

High quality single crystals of 1at.% Tm^{3+}-doped $Ca_3TaGa_3Si_2O_{14}$ (Tm:CTGS) were grown by Czochralski (Cz) method. The cell parameters were determined to be a=b=8.0010 Å, c=4.9780 Å, β=120° and Z=1 with the space group $P32$ through powder X-ray diffraction method. Polarized absorption spectra, polarized emission spectra and fluorescence decay lifetimes of Tm:CTGS crystal were measured at room temperature. Based on the Judd-Ofelt (J-O) theory, the absorption cross-section, intensity parameters, transition probabilities, radiative lifetime and branching ratios were obtained. And the polarized stimulated emission cross-sections of Tm:CTGS crystal were calculated by Fuchtbauer–Ladenburg (F-L) formula. For the *c*-cut crystal continuous-wave (CW) operation, we obtained the highest output power of 50mW at the wavelength of 1935 nm. The results reveal that Tm:CTGS crystal is a promising candidate for mid-infrared laser.