CERAMIC BROADBAND MATERIALS FOR HAPP LASERS AT HILASE

Development of high average and peak power (HAPP) lasers requires laser materials with broad emission bands along with good thermo-mechanical and thermo-optical properties. Yb doped YAG shows excellent properties at cryogenic temperature which make them attractive material for such lasers. Nevertheless, at cryogenic temperature Yb:YAG exhibit very narrow bandwidth which limits the pulse width of Gaussian transform-limited pulses to pico-second. To address this limitation, we have introduced some disorder in the regular lattice to achieve inhomogeneous broadening in the emission spectra. Yb:Y3(Al1-yGay)5O12 ceramic pellets of Yb:YAG admixed with different concentrations of Gd3+ and Ga3+ were prepared by high temperature solid-state reaction. Cubic nature of YAG is maintained even in admixed samples and is confirmed by the XRD patterns. Cryogenic emission spectra at 100K showed a significant broadening at the prominent emission peak at 1030 nm for Ga3+ admixed Yb:YAG samples whereas the broadening is weaker in Gd3+ admixed Yb:YAG. Such a broadening is necessary for sub picosecond pulse lasers operating at cryogenic temperature. Future work will be focused on studying the effect of higher concentrations (50 to 60%) of gallium and also addition of other cations such as scandium at cryogenic temperature.

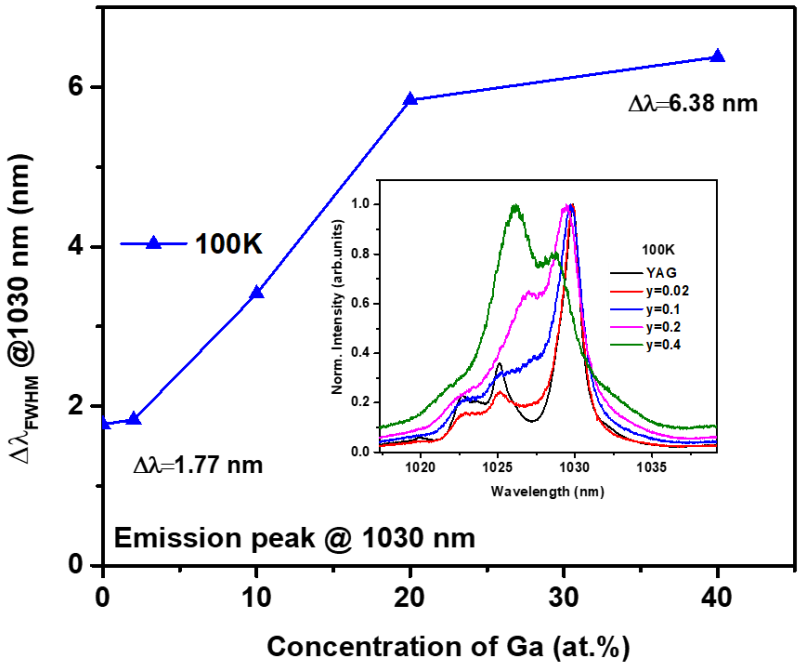

Fig. 10 Bandwidth of 1030 nm emission peak measured at 100K for Yb:YAG ceramic samples admixed with different Ga concentration. Inset shows the emission band at 1030 nm for different Ga content.

References:

S. P. David, V. Jambunathan, F. Yue, P. Navratil, M. Mika, A. Lucianetti, and T. Mocek

"Effect of Gd3+/Ga3+ on Yb3+ emission in mixed YAG at cryogenic temperature", in press, Ceramics International (2018).