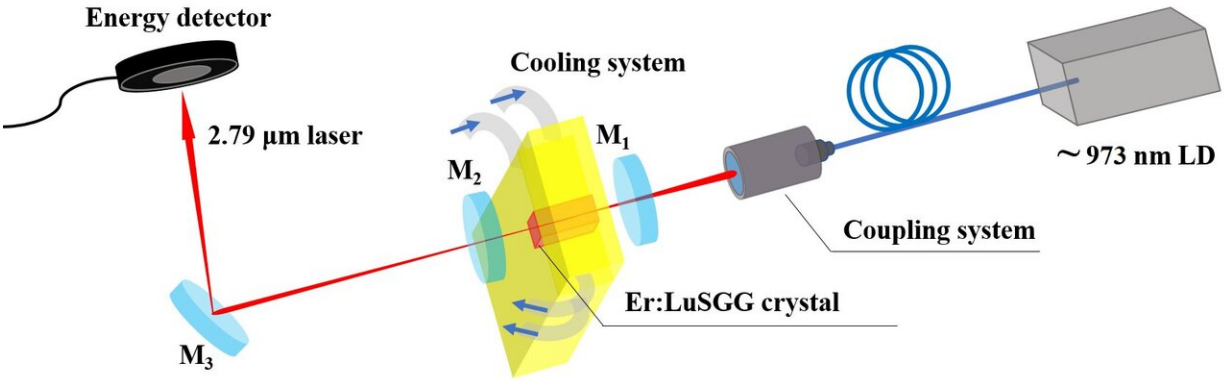
Scientists grow novel Er3+ doped LuSGG mid-infrared laser crystal

March 27 2020, by Zhang Nannan



Schematic diagram of LD pumped Er:LuSGG laser. Credit: ZHAO Xuyao

A study team has grown an Er_3^+-doped lutetium scandium gallium garnet crystal with high doping concentration. And this was the first time to grow that kind of crystal by Czochralski method. The team also announced they have achieved 2.79 μm laser with high peak power and high beam quality.

This work was done by SUN Dunlu's research group at Anhui Institute of Optics and Fine Mechanics, Hefei Institutes of Physical Science.

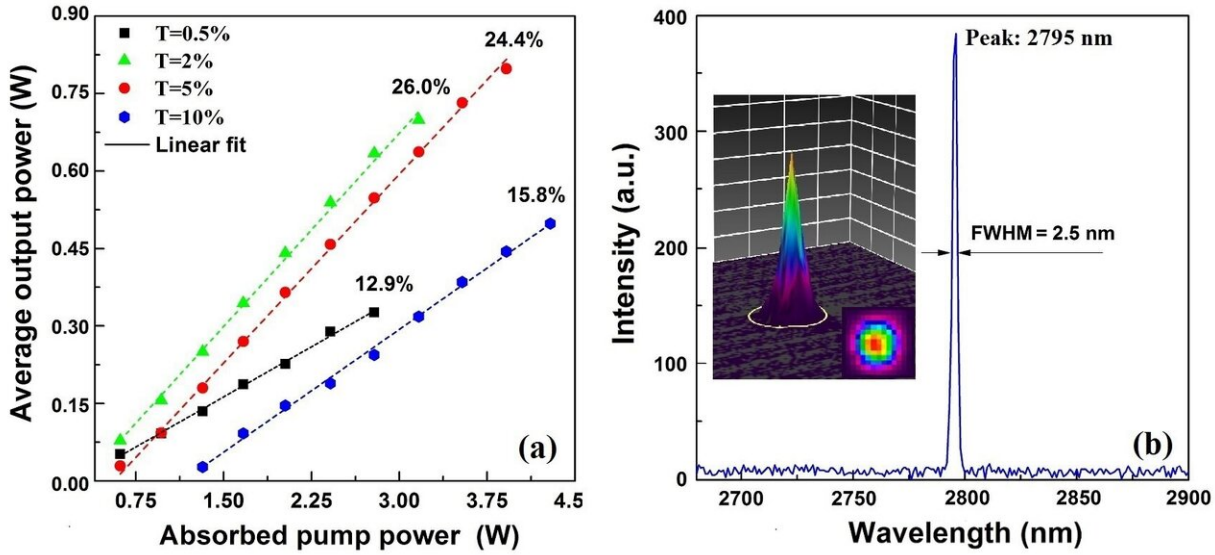
Due to the strong absorption in vaper, water and biological tissues, mid-infrared (MIR) lasers at the 2.7-3 μm waveband have drawn an

increasing interest for wide utilization. In particular, this waveband lasers with high peak power and high beam quality have many important applications in surgery, optoelectronic countermeasures and optical parametric oscillation.

The Er:LuSGG crystal possessed good laser performances on the basis of a larger crystal field and lower phonon scattering rate. In the CW regime, the 973 nm LD end-pumped Er:LuSGG laser emitted at 2795 nm with a maximum output power of 789 mW, corresponding to optical-to-optical efficiency of 20.2% and slope efficiency of 26%. The laser beam profile with the Mx^2/ My^2 factors of 1.30/1.33 was close to the fundamental transverse electromagnetic (TEM00) mode.

Besides, a matched 966 nm LD pump source and optimal cavity structure were expected to further improve the performance of end-pumped Er:LuSGG laser.

The results show that the Er:LuSGG could be a promising MIR laser material operated at 2.8 μm.



(a) CW laser output power versus absorbed pump power and (b) spectrum of the lasers with insets showing two-dimensional and three-dimensional beam profiles at the maximum output power of 789 mW. Credit: ZHAO Xuyao

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