**Laser cooling of the Yb3+-doped YAG crystal**

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**Abstract:**

Yb:YAG crystals have the properties of large absorption bandwidth, good mechanical and thermal properties. They are especially suitable for a laser gain materials of high power optical-pumped lasers. Crystals possessing excellent laser cooling properties are ideal gain medium candidates for future high power athermal lasers. Yb:YAG crystals which have been proved to have excellent laser cooling properties in theory are suitable for the athermal laser gain medium. However, the excellent laser cooling capacity of Yb:YAG crystals have not been fully proved experimentally. Utilizing a CW fiber laser, we demonstrate that the 3% Yb3+-doped YAG single crystal reaches its unprecedented cooling temperature limit of 225.3 K from the room temperature via the anti-Stokes fluorescence. The theoretical analysis based on the experimental results predicts that the cooling temperature limit of the 3% Yb3+-doped YAG crystal can reach as low as 180 K, in particular, if one further purify the crystal and reduce its background absorption coefficient to αb = 1.0×10-4 cm-1, then the sample can be cooled to ~135 K at the wavelength of 1030 nm, which thus opening up a potential pathway to develop athermal laser of high power and the solid state optical refrigeration upon this most widely used laser material.

**Biography:**

Biao Zhong joins East China Normal University as an Assistant Professor in the State Key Laboratory of Precision Spectroscopy. He received his BS in material physics from the Harbin University of Science and Technology in 2005, and his PhD in optics from East China Normal University in 2014. He is interested in cryogenic optical refrigeration in a rare-earth doped system, radiation balanced lasers, and laser materials. He is the author of more than 20 journal papers and conference proceedings.