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Near infrared broadband emission of a new bismuth-doped $\text{Gd}_{0.1}\text{Y}_{0.9}\text{AlO}_3$ crystal

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Abstract: A Bi doped $\text{Gd}_{0.1}\text{Y}_{0.9}\text{AlO}_3$ (GYAP) crystal with high optical quality was successfully grown by the Czochralski method. An intense and broadband Near-IR (NIR) 900-1700 nm emission in Bi:GYAP crystal was observed for the first time. By analyzing the emission and excitation spectra of the Bi:GYAP crystal, the optical properties were researched in details. It is found that the two broadband NIR luminescence emission mainly peaking at 1005 and 1565 nm are ascribed to two different Bi^{3+} related centers distinct sites. Moreover, the visible emission peaking at 430, 470, 515 and 630 nm are also obtained under the excitation at 250 nm, which show that there exist multiple valence states of luminescence in the mixed crystal. All these results show that Bi:GYAP crystal may become an attractive host for developing wide tuning range and ultrashort lasers at around NIR wavelength.

Highlights:

A Bi doped GYAP crystal with high optical quality was successfully grown by the Czochralski method.

An intense and broadband Near-IR (NIR) 900-1700nm emission in Bi:GYAP crystal was observed for the first time.

Bi:GYAP crystal may be an attractive host for developing wide tuning range and ultrashort lasers at around NIR wavelength.

Keywords:

0.9-1.7 μm emission.

Crystal growth.

Optical materials and properties.

Optical spectroscopy.

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