Cubic Yb^{3+}- activated Y_6MoO_{12} micro-powder — optical material operating in NIR region.

Autorzy

Magdalena Bieza

Małgorzata Guzik

Elżbieta Tomaszewicz

Yannick Guyot

Georges Boulon

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We present Yb^{3+}-doped Y_6MoO_{12} solid solutions as a very promising NIR emitting phosphor with some hope to obtain them in the nearest future in the form of transparent ceramics due to their cubic structure. The samples are crystallizing in the cubic system with the space group Fm-3m. To perform a full structural and spectroscopic analysis on the well crystallized samples they were obtained in the uniform micro-crystal forms. The ternary Y_6MoO_{12} and Yb^{3+}-doped Y_6MoO_{12} solid solutions containing a large concentration range of activator (0.1, 1, 3, 5, 10, 20 mol%) have been prepared by a high-temperature solid-state reaction method using the $Yb_2O_3/Y_2O_3/MoO_3$ mixtures annealed in the air in the temperature range of 550–1550 °C for 6 h. As-obtained samples were systematically characterized by the X-ray powder diffraction (XRD), scanning electron microscopy (SEM), UV–Vis–NIR reflectance. Furthermore, to check the thermal stability of these molybdates the thermogravimetric analysis have been performed. Finally, the luminescent properties of Yb^{3+} ions activated Y_6MoO_{12} microcrystals were investigated by using the high resolution absorption and emission techniques including the site selective spectroscopy at room and low temperatures. Basing on the absorption and emission spectra the Yb^{3+} electronic energy levels diagram has been proposed for the main site. The concentration quenching mechanism of Yb^{3+} ion in this host lattice was also discussed. Obtained results have demonstrated that Yb^{3+}-doped Y_6MoO_{12} microcrystals exhibited good luminescent properties and possess many advantages compared to other compounds based on molybdates and might have potential applications in the laser technology.

Słowa kluczowe

Yb3+ ions, Yttrium molybdate, Cubic structure, Micro-crystallites, NIR emitting laser materials