LIQUID PHASE EPITAXY AND SPECTROSCOPIC INVESTIGATION OF OPTICALLY ACTIVE $KYb(WO_4)_2$ THIN LAYERS

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In recent years, Yb^{3+} has attracted much attention as an activating ion because of its small quantum defect for laser emission from $^2F_{5/2}$ to $^2F_{7/2}$ at ~1.03 µm, which provides high efficiency and reduced heat generation. A promising material for Yb^{3+} lasers is $KYb(WO_4)_2$ (KYbW) [1]. It can be grown from high-temperature solutions [2]. A suitable substrate material for the growth of single-crystalline layers with thicknesses in the range of the absorption length of ~13 µm at 981 nm is $KY(WO_4)_2$ (KYW).

We demonstrate the liquid phase epitaxy (LPE) of KYbW layers at start temperatures as low as 520°C from the chloride solvent KCl-NaCl-CsCl. This temperature is favorable in order to decrease the thermal stresses due to the differences in the thermal expansion coefficients of substrate and layer. Moreover, the choice of [010]-oriented KYW substrates bypasses the large difference in the thermal expansion coefficient along the [010] direction. Our spectroscopic investigations show that the fluorescence lifetime of ~250 µs measured in our LPE-grown KYbW layers is dominated by radiative decay and is very similar to that measured in top-seeded-solution-grown bulk samples [2]. Fast energy migration among the Yb^{3+} ions and energy transfer to small amounts of Tm^{3+} and Er^{3+} ions present in the $YbCl_3$ reagent lead to visible upconversion luminescence in the layers under 981-nm excitation.

[1] P. Klopp, U. Griebner, V. Petrov, X. Mateos, M.A. Bursukova, M.C. Pujol, R. Solé, J. Gavaldà, M. Aguiló, F. Güell, J. Massons, T. Kirilov, F. Díaz, *Appl. Phys. B* **2002**, *74*, 185

[2] M.C. Pujol, M.A. Bursukova, F. Güell, X. Mateos, R. Solé, J. Gavaldà, M. Aguiló, J. Massons, F. Díaz, P. Klopp, U. Griebner, V. Petrov, *Phys. Rev. B* **2002**, *65*, 165121