Flux Growth and Characterization of Gallium-substituted $\mathrm{YAl}_3(\mathrm{BO}_3)_4$ Crystals

<u>Victor Maltsev</u>, Nikolay Leonyuk, *Department of Crystallograph Geological Faculty, Lomonosov Moscow State University.* E-mail: maltsev@geol.msu.ru

Non-centrosymmetric YAl₃(BO₃)₄ (YAB) crystals of huntite structure, especially, doped with Tm, Yb, Eu, Er are of most interest as promising multifunctional solids for lasing and non-linear optical applications [1]. So far, no borate of this family is found in the nature, although Italian mineralogists have recently discovered anhydrous rare earth (RE) metaborate with closely spaced chemical composition [2]. For this reason, investigations of crystallogenesis in complex flux systems based on high-temperature RE borates are important from both scientific and technological viewpoints. The present work is focused on flux growth and characterization of Y(Ga_xAl_{1-x})₃(BO₃)₄ (x = 0, 0.05, 0.15, 0.2, 0.4) (YGAB) single crystals. YGAB crystals were obtained by top seeded solution growth technique as wel as spontaneous nucleation under different conditions using a K₂Mo₃O₁₀ based flux. As a result, transparent and homogenous YGAB single crystals with size up to 3 mm have been grown. From ASEM data, it was found that the average Ga distribution coefficients in YGaAB crystals slightly rises from 0.84 to 0.98 with increase of Ga concentration in the initial borates from 5 to 15 at %.

This research was supported, in part, by RFBR grant № 04-05-64709.

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Keywords: boron compounds, crystal growth from solution, crystal characterization