

CRYSTAL GROWTH FOR IR-RANGE LASERS.

V.N. Matrosov, T.A. Matrosova, E.V. Pestryacov, V.V. Petrov.
Belarusian State Polytechnical Academy
Partizansky Ave. 77, Minsk, 220107, Belarus
Phone/Fax: (375 17) 245 53 11 ; E-mail: pb7028@belsonet.net

Works of alexandrite ($\text{BeAl}_2\text{O}_4:\text{Cr}^{3+}$) and berillium hexaluminate ($\text{BeAl}_6\text{O}_{10}:\text{Cr}^{3+}$) high optical quality crystal growing are planned to be accomplished under the Project ISTC # B-263.

Alexandrite lasers found broad application in medicine: photodynamic cancer therapy, blood purification during AIDS treatment, skin and hypodermic tissue therapy, hair epilation. Besides, the company "Light Age" produced fist tunable alexandrite lasers with diode pumping as well as laser with double frequency effect, operating at 720nm to 190nm. However, there are some obstacles which prevent their wide introduction to practice. These are beam break-down (low beam strength of crystals), absorption nonuniformity of pumping energy along the crystal length, low optical quality. All above-mentioned problems are closely related to crystal growth process and can be diverted with the development of appropriate technology for their obtaining. Particularly this is the leading aim of the Project.

Berillium hexaluminate is a new crystal. We were the first who obtained it. Its tunable range in comparison with alexandrite removed to IR-range. Crystal can be effectively pumped both by diodes ($\lambda = 650\text{-}670\text{ nm}$) and by lamps.

It's leaked out that maximal therapeutic effectiveness is reached thanks to laser radiation affect of the following wavelength : 0,8-0,95 mkm ; 0,63-0,69 mkm; 0,45-0,59 mkm; 0,25-0,3 mkm. $\text{BeAl}_6\text{O}_{10}:\text{Cr}^{3+}$ laser with frequency doubling get into these regions, so it will be very prospective for medical application.

Moreover, spectra-generation characteristics of these crystals allow to use them in the same resonator. This hybrid laser will help to obtain tunable generation from 700nm to 1000nm and broaden ability of the practical use significantly.

Both crystals are grown by Czochralski technique from iridium crucibles in neutral atmosphere.

The paper carefully considers the reasons of above-listed defects forming in crystals and gives methods how to get rid of them.

The final result of work process under the Project ISTC # B-263 is the development of obtaining technology for high quality above-mentioned crystals with optical losses at maximum generation wavelength less or equal to $0,002\text{ cm}^{-1}$.