

EFFECT OF ANNEALING IN H₂O VAPOUR ON LiNbO₃ OPTICAL PROPERTIES

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The effect of annealing of lithium niobate crystals in water vapor on optical properties of the crystals in visible and near IR regions has been studied.

The studied nominally pure and MgO-doped congruent lithium niobate crystals were grown by the Czochralski technique. To increase the optical homogeneity the crystals were doubly crystallized. The magnesium content exceeds a threshold concentration and was about 5 mol.% of MgO.

Samples in the form of plates (0.5 mm thickness, normal to X and Z axes) and parallelepipeds (5x7x10 mm, oriented along X, Y and Z) have been prepared and used for investigations.

The optical absorption spectra of the crystals in the 300...3000 nm spectral region were measured before and after thermal treatments using a Shimadzu UV3600 Spectrophotometer. The thermal treatments were performed in water vapor in a special furnace at temperature 400, 600, 800 or 1000°C.

After such kind of treatments, the samples have got a dark color caused by arising of the strong absorption band at 500 nm. As the temperature of annealing was higher, the intensity of this absorption band was greater.

In the IR region, the absorption of OH bonds was observed both for the as-grown and annealed samples. Changes in the form of the absorption band after such treatments have been observed. The obtained results are compared with known results on influence of high-temperature treatments of lithium niobate in reducing and oxidizing atmospheres.