Method of optical cleaning of lithium niobate crystals

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It is shown theoretically and experimentally that trapped electrons can be removed from the working area of a lithium niobate crystal at modestly high temperatures. The decrease of the electron concentration can be as large as several orders of magnitude. This changes strongly the material properties, such as position of the Fermi level, the light absorption coefficient, and the threshold of optical damage. The photogalvanic drift and charge compensation by optically passive thermo-activated ions lie in the basis of the cleaning method. Employment of moving light beams increases strongly the cleaning rate. The beam intensity and transverse size are the main control parameters in addition to the temperature and velocity. In experiment, light absorption has become undetectable and the threshold of optical damage has increased by more than three orders
of magnitude. The method is applicable to numerous materials possessing the bulk photogalvanic effect (Fig. 1.1).

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