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Trace Impurities and Radiation Defects in Optical Materials GALINA MALOVICHKO, VALENTIN GRACHEV, MARTIN MEYER, MARK MUNRO, VLADIMIR PANKRATOV, Montana State University — Trace impurities and radiation defects lead to inevitable performance degradation of devices based on optical materials. The results of the Electron Paramagnetic Resonance (EPR) study of defects in as grown and irradiated single crystals are reported. Among investigated optical materials are $LiNbO_3$, $Li_2B_4O_7$, $KTiOPO_4$ etc. Crystals from different vendors or grown by different ways have different concentrations of non-controlled impurities and, as a result, different physical properties, including radiation resistance. Intrinsic defects (vacancies and antisites), usually present in congruent non-stoichiometric crystals like lithium niobate and tantalate. Many EPR lines of non-controlled impurities were found in $KTiOPO_4$ crystals. We found that dominating types of defects formed under visible, UV and gamma photon irradiation are centers created by defects trapped electron or hole. The neutron and high energy electron irradiation creates stable Frenkel pairs - interstitial ions and vacancies. Computer simulation of observed spectra allowed us to determine spectroscopic characteristics and models for more than dozen trace impurities and radiation defects. Obtained data about atomic defects can be used for a selection of materials suitable for various applications.

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