Abstract Submitted
for the NWS11 Meeting of
The American Physical Society

EPR of Cr^{3+} and Fe^{3+} centers in congruent and stoichiometric lithium niobate crystals doped with Mg JONATHAN JORGENSEN, Montana State University, GALINA MALOVICHKO, Montana State Universtiy, VALENTIN GRACHEV, Montana State University — Transition metal doping in $LiNbO_3$ (LN) has been developed during the search for potential laser devices. Doping with Mg in a concentration above 6 at.% reduces the material's susceptibility to optical damage. However, it causes EPR line broadening due to an even larger disorder in the lattice compared to single-doped congruent crystals, which have a significant amount of niobium anti-sites and lithium vacancies. This has made determining the structure of impurity centers more difficult than in single-doped crystals, and models of impurity centers in LN:Mg were not determined until now. Detailed measurements of angular dependencies of EPR lines in X- and Q-band has shown Cr^{3+} pairs appearing in highly doped material. Unexpectedly, besides Cr^{3+}-Cr^{3+} pairs substituting for both Li^+ and Nb^{5+} (self-compensating pairs), pairs with chromium occupying two neighbor Li^+ sites were also found. Significant line narrowing in stoichiometric LN:Mg crystals allowed us to distinguish four different Fe^{3+} centers. The obtained results provided the keys for understanding Cr and Fe centers in both congruent and stoichiometric materials. This is important for fundamental material science and tailoring material properties for applications. The work was supported by NSF grant DMR- 0805175.

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Date submitted: 19 Sep 2011 Electronic form version 1.4