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ABSTRACT:

A High-Temperature Optical Spectroscopy Study of Lithium Tantalate, $LiTaO_3$

L. Eisner[1], H. Fritze[1], K.-D. Becker[2]
[1]Technische Universität Clausthal, 38640 Goslar, Germany
[2]Technische Universität Braunschweig, 38106 Braunschweig, Germany

Lithium niobate (LN) and lithium tantalate (LT) are among the most extensively studied complex oxide materials for high-tech applications which make use of piezoelectric, pyroelectric, photoelectric, or photorefractive properties. Until recently, the focus had been mainly on lithium niobate; the isostructural LT has been studied to much lesser extent.

Optical absorption spectra of chemically reduced LN are dominated by broad bands in the visible and NIR region which have been attributed to different types of electron small-polarons [1]. The kinetics of these redox processes have been studied at high temperatures in relaxation-type experiments. They have been shown to provide a non-conventional route to diffusion and transport properties of the material [2,3]. The present contribution reports results of an optical spectroscopy study of undoped and of Mg-doped lithium tantalate with focus on oxidation and reduction of the material. The study reports on the assignment and on the evolution of defect bands with temperature as well as on the kinetics of diffusion-related redox processes in LT at high temperatures.

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