

Ionic Conductivity comparative study of LiZnVO_4 and LiMgVO_4

A. Kazakopoulos¹, C. Sarafidis², O. Kalogirou²

¹*Department of Electronics, T.E.I. of Thessaloniki 57 400 Thessaloniki Greece*

²*Dept. of Physics, Aristotle University of Thessaloniki, 54124 Thessaloniki, Greece*

Abstract:

LiMgVO_4 and LiZnVO_4 are materials used in electrochemical devices and in humidity sensors. In particular LiMgVO_4 has interesting properties related to luminescence due to the tetrahedrally coordinated V^{5+} atoms. The information related to the cation distribution in the LiMgVO_4 structure is still under debate. The LiMgVO_4 has been assigned to the olivine Pnma space group. The purpose of this work is to study and compare the conduction mechanisms of LiMgVO_4 and LiZnVO_4 at temperatures from 25 to 500 °C, using impedance spectroscopy measurements at frequencies from 42 Hz to 1 MHz, in order to deduct useful information about the Li ion diffusion and mobility in its structure. The bulk activation energy values were calculated to be around 1.20 eV, while two grain boundary conductivity processes were detected with activation energies almost half of the bulk (at near room temperature area) and 1.4 eV at higher temperatures. In both stoichiometries the loss factor ($\tan\delta$) versus frequency presents one peak in the temperature range from 400 – 500 °C which suggests the presence of relaxation procedures. The modulus master curves present a scaling behavior that suggests non Debye type conductivity relaxation and ion migration via hopping.