# OPTIMIZATION OF ELECTRICAL PROPERTIES OF NANOCRYSTALLIZED VANADIUM-DOPED LITHIUM-MANGANESE-BORATE GLASSES

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Energy storage field is becoming more crucial nowadays, especially when it comes to ecological energy sources or electric cars industries. Therefore, it is worth to focus on studies towards new potential cathode materials in order to improve batteries parameters, especially when demand on electrochemical cells is rising.

Lithium manganese borate has found high interest in nowadays research on cathode materials for Li-ion batteries mostly due to its high theoretical gravimetric capacity of 222 mAh/g [1], which is even greater than for the widely studied phosphates. A glassy sample with nominal composition $LiMnBO_3$ was successfully synthesized using melt-quenching method and exhibited promising glass-forming properties. Therefore, thermal nanocrystallization method was applied then to obtain nanocrystalline material and study its properties [2]. However, our research on this compound showed that final electrical conductivity after nanocrystallization was still not sufficient enough. Basing on the studies [3] on vanadium-doped $LiFePO_4$ compound and on conclusion that even small amount of vanadium can significantly improve electrical and electrochemical properties of material, we attempted to dope aforementioned $LiMnBO_3$ with vanadium.

Glassy $LiMn_{0.925}V_{0.05}BO_3$ was successfully synthesized with use of melt-quenching process. Then, the samples were nanocrystallized in different temperatures and characterized with structural (XRD, SEM), thermal (DTA), and electrical (IS, TEP) methods.

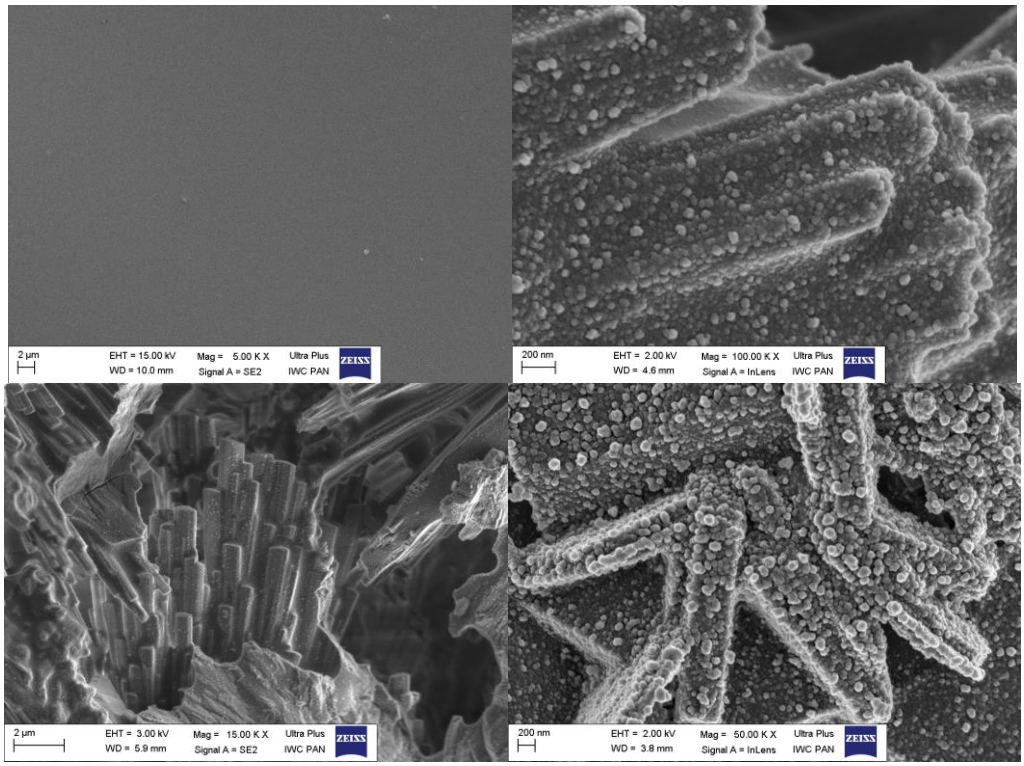


Fig. 1. SEM images for samples: upper left – amorphous, upper right – nanocrystallized at 600 °C, bottom left – nanocrystallized at 625 °C, bottom right – nanocrystallized at 675 °C.

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[2] A. Gołębiewska, Bachelor Thesis, Warsaw University of Technology (2017).
[3] F. Omenya, N.A. Chernova, S. Upreti, P.Y. Zavalij, K.-W. Nam, X.-Q. Yang, M.S. Whittingham, Chemistry of Materials 23 (2011) 4733-4740.