The Open-Access Journal for the Basic Principles of Diffusion Theory, Experiment and Application

Slow Lithium Self-Diffusion on the Nanoscale Studied by Macroscopic and Microscopic Methods

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Fast Li diffusion processes in solids, generally taking place in ion-conductors, are routinely studied in literature due to their importance for battery materials. In contrast, slow diffusion processes are investigated less often. Nevertheless, they are likewise of fundamental interest for understanding material stability (amorphous and nano-crystalline materials) and in order to obtain a coherent general view. In this context, diffusion on short length scales of some nanometers is of special interest due to the given structural peculiarities.

Here, we report on slow Li self-diffusion in lithium containing metal oxide compounds with special emphasis on the influence of structural disorder on diffusion. Case studies on $LiNbO_3$, $LiTaO_3$, $LiAlO_2$, and $LiGaO_2$ are presented [1–9]. The focus is on comparative studies by macroscopic tracer methods (Secondary Ion Mass Spectrometry, Neutron Reflectometry) and microscopic methods (Nuclear Magnetic Resonance Spectroscopy, Impedance Spectroscopy) on the same type of material.

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