Fast and Slow, Restricted or Free, Correlated or Random: The Complex World of Li Diffusion as Seen by Solid State NMR

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Li-bearing ceramics offer a large playground to study ion dynamics in solids with the help of spectroscopic tools. Motivated by fundamental questions and inspired by applications we used a large set of complementary techniques in our lab not only to quantify Li jump processes but also to study mechanistic details as well as the extent of correlation effects on ion dynamics. While high-resolution and time-domain nuclear magnetic resonance (NMR) as well as impedance spectroscopy served as the main methods applied, we also took advantage of mechanical relaxation and electrochemical methods to characterize dynamic properties. The present talk will briefly summarize our activities in the FOR 1277 "Mobility of Li Ions in Solids" (molife) thankfully funded by the DFG. Selected examples on the following topics will be presented:

- spatially restricted diffusion, influence of dimensionality, see, *e.g.*, [1–6],
- influence of structural disorder on lithium ion transport, see, *e.g.*, [7, 8],
- diffusion pathways in crystalline materials, see, *e.g.*, [9],
- extremely slow ion dynamics, see, *e.g.*, [10], and,
- fast ion dynamics in (nanostructured) ion conductors, see, *e.g.*, [11, 12].

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