T01 Nuclear Magnetic Resonance - CEA

TEESMAT
Open Innovation Test Bed for Electrochemical
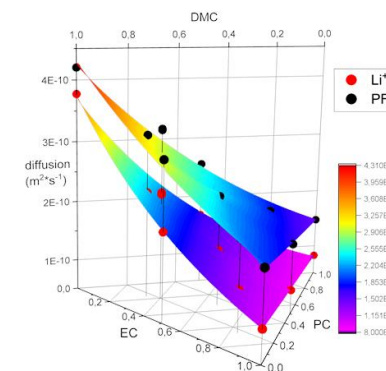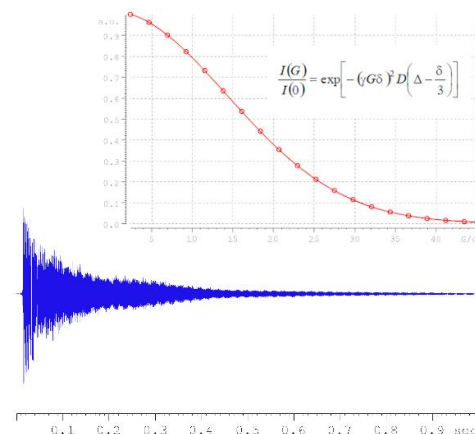Energy Storage Materials

How it works

NMR spectrometry is well known for structural elucidation of chemical compound. Based on magnetic properties of some nucleus and their interaction with a strong magnetic field, a specific signal is observed for each position in a molecule after an appropriate RF excitation.

Additional magnetic field gradient combine with NMR probe allows to spatially encode the sample. Using appropriate NMR techniques, the mobility of the different elements could be track in the solution.

What can be seen

Self diffusion coefficient can be measured for each components of a mixture. Separate ions transport number in an electrolyte or hydrodynamic radius of a molecule can be extracted from the previous results.

$$\frac{I(G)}{I(0)} = \exp\left[-(\gamma G \delta)^2 D\left(\Delta - \frac{\delta}{3}\right)\right]$$

What kind of sample ? A large field of compound could be investigate using NMR techniques if they contain observable nucleus such 1H , 19F, 7Li … They also need to be liquid or convenient for dissolution. The measurable diffusion coefficient range usually goes from 10^{-8} m^2s^{-1} up to 10^{-13} m^2s^{-1} .

Why is it useful ? This technique is helpful for control and analysis of electrolyte in battery field or for size and complexation determination.

Investigation time-scale : days / weeks

Maturity level : advanced