Muon spin relaxation and beta-detected ^{8}Li-NMR as the real-space probe methods of ionic motions

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Abstract

Muon spin relaxation (μSR) and its un-stable nucleus version (beta-detected NMR) are microscopic probe of materials, particularly sensitive to dynamics occurring in non-periodic (random) arrangements. Unlike neutron or X-ray scattering techniques, μSR and beta-detected NMR provides the real space information from the point probe (muon or ^{8}Li particularly) in the dilute limit. This feature contrasts to the reciprocal space nature of the neutron or X-ray scattering, and provides complementary information in magnetism, superconductivity, soft matters, and particularly, in battery materials where ionic diffusion plays an important role. In my lecture, I will explain how the probe method works, and present a few examples including Li ion diffusion measurements in battery materials.

Bio

Dr. Kenji M. Kojima has 30+ year experience of condensed matter research using muon and other probes. He obtained his PhD at the University of Tokyo in 1996 on studies of Quantum Magnets using muons and neutrons. He spent two years as a Postdoctoral fellow at Columbia University (New York), and came back to the University of Tokyo as a Research Associate / Assistant Professor. He moved to KEK (an accelerator facility in Japan) in 2009 as an Associate Professor and developed the muon spin spectrometers at J-PARC MLF, which are currently operational. In 2018, he moved to TRIUMF, the Canadian accelerator facility and UBC, where he had been a frequently visitor for experiments. He is now a Senior Researcher (TRIUMF) and an Affiliate Associate Professor (UBC). His current research areas are semiconductors, magnetism and superconductivity using muons and neutron scattering techniques, and also instrumentations for the future muon spectroscopies.