Contribution ID: **70** Type: **Poster Presentation**

Re-analysis of μSR Data on Battery Materials Using the Extended Dynamic Kubo-Toyabe Model

The μSR method has been widely used in recent years to study ion diffusion in battery materials. In data analysis, a dynamic Kubo-Toyabe function is often used in which the internal magnetic field distribution $n(B)$ fluctuates with frequency ν. The model also presumes that $n(B)$ at the muon site remains constant and uncorrelated between fluctuations [1]. However, it has been pointed out that such assumption does not hold in battery materials [2]. While ions with nuclear magnetic moments I, such as, Li^+ and Na^+, jump around the muon, the other elements forming a framework of the material, such as, Co and Mn ($I > 0$), keep their positions. As a result, finite correlation remains in $n(B)$, which contradicts the above assumption. Furthermore, it has been pointed out that muons themselves also start to diffuse above a certain temperature. To address this issue, a modified model has recently been proposed in which the autocorrelation function is decomposed into a dynamic and a static part [2,3].
Therefore, we have reanalyzed the past μSR spectra for Li_xCoO_2 and Na_xCoO_2 [4,5] using this extend model.

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Email

hiramasa@post.kek.jp

Funding Agency

Supervisors Name

Supervisors Email

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Primary author: HIRAISHI, Masatoshi (KEK-IMSS)

Co-authors: PANT, Amba Datt (KEK/J-PARC center); UMEGAKI, Izumi (KEK (High Energy Accelerator Research Organization)); SUGIYAMA, Jun (CROSS Neutron Science and Technology Center); Dr OHISHI, Kazuki (CROSS Neutron Science and Technology Center)

Presenter: HIRAISHI, Masatoshi (KEK-IMSS)

Session Classification: Poster Session 1

Track Classification: Energy storage materials