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## Ion-texturing & Dynamics in Layered Compounds: From Electric Automobiles to Frustrated Magnetism

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The drastic change from an insulating antiferromagnet to a superconducting state in cuprates, is probably the best example of how a slight change in carrier-density governs the magnetic/electronic properties of a material. Further, also ion-order within the intermediate charge-reservoir layers is of importance e.g. charge-order in the battery-type material  $\text{Na}_x\text{CoO}_2$ . In this compound, a novel low-temperature magnetic phase was presented, connected to the thermal history above 200K i.e. also ion-dynamics is crucial. From the context of rechargeable batteries for electrical automobiles, we present a novel experimental method [Sugiyama-PRL/103/147601/(2009)] to investigate microscopic ion-dynamics in lithium-transition-metal-oxides (Li-TMO's). By using muon-spin relaxation we obtained unique results from many different Li-TMO's. Here we summarize these results and the importance for development of novel thin-film batteries is discussed. Finally, we will present our latest results, regarding Na-dynamics in magnetically frustrated  $\text{Na}_x\text{CoO}_2$  so as to understand the possibility of tuning it's magnetic/electronic properties.

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**Primary author:** Dr MANSSON, Martin (Laboratory for Solid State Physics, ETH Zurich)

**Co-authors:** Prof. ZHELUDEV, Andrey (Laboratory for Solid State Physics, ETH Zurich); Dr POMJAKUSHINA, Ekaterina (LDM, PSI, Switzerland); Dr JURANYI, Fanni (LNS, PSI, Switzerland); Dr NOZAKI, Hiroshi (Toyota Central Research and Development Labs. Inc., Japan); Prof. WATANABE, Isao (Muon Science Laboratory, RIKEN, Japan); Dr LORD, James S. (ISIS, Rutherford Appleton Laboratory, U.K.); Dr GAVILANO, Jorge (LNS, PSI, Switzerland); Dr SUGIYAMA, Jun (Toyota Central Research and Development Labs. Inc., Japan); Dr CONDER, Kazimierz (LDM, PSI, Switzerland); Dr MUKAI, Kazuhiko (Toyota Central Research and Development Labs. Inc., Japan); Dr KAMAZAWA, Kazuya (Toyota Central Research and Development Labs. Inc., Japan); Dr HARADA, Masashi (Toyota Central Research and Development Labs. Inc., Japan); Prof. TAKEUCHI, Tsunehiro (Department of Crystalline Materials Science, Nagoya University, Japan); Prof. OHZUKU, Tsutomu (Dep. of Applied Chemistry, Osaka City University, Japan); Dr POMJAKUSHIN, Vladimir (LNS, PSI, Switzerland); Dr IKEDO, Yutaka (Muon Science Laboratory, KEK, Japan)

**Presenter:** Dr MANSSON, Martin (Laboratory for Solid State Physics, ETH Zurich)

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