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ABSTRACT:

Low-Temperature Magnetism in Ni(II)-Fe(III) Layered Double Hydroxides

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Layered double hydroxides (LDH) are naturally 2-D anisotropic solids with unique capacity of intercalation and exchange of anion species of various nature and dimensions. LDH with magnetic transition metal cations in the hydroxide layers are promising as tunable 2-D magnets for applications in sensing as well as in energy storage and conversion. Among magnetic LDH, Ni(II)-Fe(III) layered hydroxides are the most studied and the most controversial at the same time [1]. Unusual temperature- and field-dependent magnetic response of these materials result from complex in-layer and inter-layer long-range interactions as well as spin-glass behavior. Competing magnetic orderings of these LDH are very sensitive to their chemical composition of and, thereby, to the preparation ways.
We have performed a combined study of a series of Ni-Fe-OH LDH prepared via two different synthesis techniques using advanced methods of high-resolution electron microscopy, SQUID magnetometry and synchrotron-based XAS & XMCD to extract true (intrinsic) magnetic properties of these materials. The observed features of the magnetic-field-dependent behaviour of these LDH are discussed with respect to their similarities and differences caused by metal cation composition and the preparation methods.

[1] J.A. Carrasco, V. Oestreicher, A. Seijas-Da Silva, G. Abellán. Appl. Clay Sci., 243, 107073 (2023).