



PHYSIKALISCHES KOLLOQUIUM

Mittwoch, 21.05.2014, um 16:00 Uhr

Ort: Reichenhainer Str. 90; Neues Hörsaalgebäude, Raum: 2/N013



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Functional magnetic (nano)materials: From fundamental research towards applications

New materials promise novel functionalities and applications. This particularly holds for nanoscaled materials which can exhibit novel materials properties that appear upon reducing the dimensions of their bulk counterparts. From a fundamental research point of view it is the fundamentally different physical properties which attract the attention to these materials. The example presented here is the class of lithium transition metal phosphates LiMPO_4 ($M = \text{Fe}, \text{Mn}, \text{Co}, \text{and Ni}$) which is utilised for high-energy lithium-ion batteries. Concomitantly, lithium transition metal phosphates reveal a variety of unusual magnetic, magnetoelectric, and ferrotoroidic properties associated with high spin M^{2+} -ions. In all compounds, long-range antiferromagnetic spin order evolves at low temperature and coupling of spin, charge, and structural degrees of freedom is demonstrated, e.g., by pronounced magnetoelectric effects. The growth of the materials with tailored size and morphology, the growth mechanism and the growth of large single crystals will be discussed in detail. Electrochemical characterisation reveals the potential for actual usage in lithium-ion batteries. Magnetic measurements by means of macroscopic, ESR, and NMR studies imply that strong geometrical spin frustration and possibly incommensurate magnetic ordering in LiCoPO_4 . Thermal expansion and specific heat studies on single crystalline $\text{Li}(\text{Mn},\text{Ni})\text{PO}_4$ show a pronounced magneto-elastic coupling while Grüneisen-scaling indicates unusual anisotropic pressure dependence.

Alle Zuhörer sind ab 15:45 Uhr zum Kaffee vor dem Hörsaal eingeladen.