MS15-1-6 Synthesis and characterization of the solid-solution series $NaYb_{1-x}Lu_xS_2$ in the α-$NaFeO_2$ structure type #MS15-1-6

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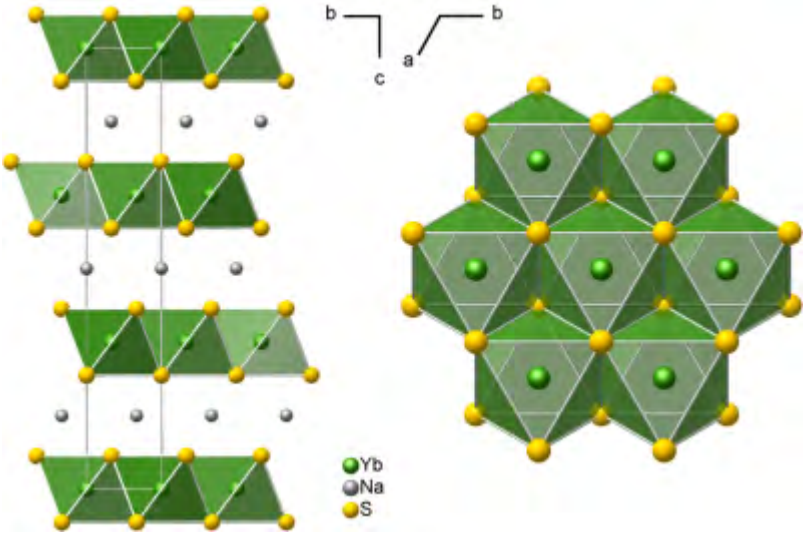
Abstract
Materials with the α-$NaFeO_2$ structure have lately attracted considerable interest in quest of a unique magnetic ground state – the quantum spin liquid (QSL) state. In this structure type antiferromagnetically interacting trivalent rare earth ions with J_{eff} = ½ can be arranged on a regular triangular sublattice (see Figure 1) thus providing the perfect geometrical basis for studying this kind of frustrated spin system. Indeed, no magnetic order was found in NaYb*Ch*$_2$ (*Ch* = S, Se) down to 260 mK [1,2].To investigate the interplay of the electron spins with respect to the magnetic properties in detail, we subsituted the Yb^{3+} ions in $NaYbS_2$ with non magnetic Lu^{3+} to dilute the magnetic sublattice. As the spin-spin interactions are influenced by the geometric confinements of the structure we had a detailed look on the structural parameters before determining the magnetic susceptibility and the electron spin resonance (ESR) properties. We characterized the samples of the solid solution series $NaYb_{1-x}Lu_xS_2$ with $0 \leq x \leq 1$ with respect to their chemical composition, analyzed their structural parameters in single crystal and powder X-ray diffraction experiments and evaluated the structural changes (see Figure 2 for the lattice parameters) throughout the whole substitution series. In this contribution, we report on the synthesis and the crystallographic details of the structure and give an insight into the physical properties obtained via ESR spectroscopy and magnetization measurements.

References
[1] M. Baenitz, Ph. Schlender, J. Sichelschmidt, Y. A. Onykiienko, Z. Zangeneh, K. M. Ranjith, R. Sarkar, L. Hozoi, H. C. Walker, J.-C. Orain, H. Yasuoka, J. van den Brink, H. H. Klauss, D. S. Inosov, Th. Doert, *Phys. Rev. B* **2018**, 98, 220409.
[2] W. Liu, Z. Zhang, J. Ji, Y. Liu, J. Li, X. Wang, H. Lei, G. Chen, Q. Zhang, *Chin. Phys. Lett.* **2018**, 35, 117501.

Crystal structure of NaYbS2 in R-3m.



Refined lattice parameters of NaYb1–xLuxS2 samples