Investigation of the magnetic structure of $EuCu_9Sn_4$ via powder neutron diffraction

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Members of the RCu_9Sn_4 family (R = rare-earth element) are scarcely explored, but of potentially broad interest as model intermetallic magnets, where the R atoms form a square lattice and display complex magnetic interactions. A recent study showed that $PrCu_9Sn_4$ is a ferromagnet with T_c = 10.5 K with field-modulated tricriticality [1], while $CeCu_9Sn_4$ is also a ferromagnet (T_c = 4.4 K), its magnetization curves indicate a strong Ising anisotropy and significant crystal electric field effect [2]. Apart from these two cases, little is known about other members of the RCu_9Sn_4 family. Here, we present characterization of $EuCu_9Sn_4$, for which previous studies indicate contradictory results about its magnetic structure [2,3]. Our data showed strongly anisotropic magnetic properties of $EuCu_9Sn_4$, and while magnetic measurements on single crystals indicate antiferromagnetic interactions, the neutron powder diffraction experiments unambiguously showed that the ground state of $EuCu_9Sn_4$ is ferromagnetic.

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[2] Hirose, Y., et al. J. Phys.: Conf. Ser. 592 (2015) 012034.
[3] D. Mazzone et al., J. Alloys Compd. 453 (2008) 24–31.