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Spin glass and semiconducting behavior of the flux grown $BaFe_{2-\delta}Se_3$ crystals[1] BAYRAMMURAD SAPAROV, STUART CALDER, BALAZS SIPOS, HUIBO CAO, SONGXUE CHI, DAVID SINGH, ANDREW CHRISTIANSON, MARK LUMSDEN, ATHENA SEFAT, Oak Ridge National Laboratory — In this talk, physical properties and crystal and electronic structures of $BaFe_{2-\delta}Se_3$ crystals, synthesized using tellurium flux, will be discussed. This phase is an iron-deficient derivative of the $ThCr_2Si_2$-type and its structure is made of double chains formed from edge-sharing $FeSe_4$ tetrahedra. The semiconducting $BaFe_{2-\delta}Se_3$ with $\delta \approx 0.2$ does not order magnetically, however, there is evidence for short-range magnetic correlations of spin glass type below 50 K in magnetization, heat capacity and neutron diffraction results. The semiconducting behavior of $BaFe_{2-\delta}Se_3$ is in line with the detrimental influence of iron deficiency to the superconductivity in $A_xFe_{1.8}Se_2$ (A = alkali metal) superconductors. The electronic structure calculations suggest that this compound can be considered as a low-dimensional (1D) ladder structure with a weak interchain coupling. Based on the survey of available data on $BaFe_2Se_3$ so far, lower concentrations of iron vacancies may lead to a long range antiferromagnetic order, whereas higher concentrations of iron vacancies may suppress long range order and then lead to a spin glass behavior.

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