583rd ASRC Seminar

Date: 10:00 ~11:00, 18 February

Location: 6th meeting room, Lab. Bldg. #1

Speaker: Dr. Tomasz Klimczuk

(Faculty of Applied Physics and Mathematics, Gdansk University of Technology)

Title: NpFeAsO, $NpPt_2In_7$ and Np_2PdIn_8 : recently discovered Np-based compounds

NpFeAsO, is one of the few actinide-based iron-oxypnictide compounds. Although one may expect the physical properties of NpFeAsO to be similar to the lanthanide 1111 analogues, in reality this system behaves differently. In particular, we do not observe any structural transition, in agreement with the absence of the high-temperature anomalies associated with an in-plane magnetic ordering in the Fe-As layer. The temperature-dependent magnetic susceptibility, electrical resistivity, Hall coefficient, and specific-heat measurements reveal a long-range magnetic order below a critical temperature T_N = 57 K. Below T_N, powder neutron diffraction and the Mossbauer spectroscopy measurements reveal an antiferromagnetic structure of the Np sublattice, with an ordered magnetic moment of 1.70 ± 0.07μ_B aligned along the crystallographic *c* axis.

The neptunium analogues of the $CePt_2In_7$ and Ce_2PdIn_8 layered intermetallic compounds have been synthesized and characterized by means of resistivity, magnetic susceptibility and heat capacity techniques. Rietveld analysis of the powder x-ray diffraction patterns of $NpPt_2In_7$ and Np_2PdIn_8 confirm tetragonal structure type for both compounds, with lattice parameters similar to the previously reported for $CePt_2In_7$ and Ce_2PdIn_8, respectively.

For $NpPt_2In_7$ an antiferromagnetic transition was observed with the Néel temperature T_N = 23 K. Rather complex magnetism is revealed for Np_2PdIn_8 with ferromagnetic and possibly antiferromagnetic transitions at T_C = 9.5 K and T_N = 8.5 K, respectively. For both $NpPt_2In_7$ and Np_2PdIn_8 a Curie-Weiss fit of the high-temperature magnetic susceptibility curve, $\chi(T)$, gives an effective magnetic moment as expected for trivalent Np.

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