

21 世紀 COE セミナー

平成16年9月21日 (火) 17:00~18:00

理学研究科H棟3階コミュニケーションスペース

Magnetic Properties of Transuranium Compounds

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Due to their high radio toxicity and self heating effect, transport properties of transuraniums compounds (Np, Pu, Am, Cm) have been poorly known especially at low temperature ($T < 1$ K). Pressure studies have been achieved mainly on the crystallographic structure to observe localization-delocalisation of the 5f electrons. We developed recently high pressure resistivity facilities for measurement down to 300 mK and up to 30 GPa. Np, Pu and Am-115 systems compounds have been studied. The dramatic change of superconducting state developing in Am metal at temperature lower than 2 K has set a new challenge to overcome the technical difficulties imposed by the manipulation of these of materials (radio toxicity and heating power of 6.3 mW/g for ^{243}Am). Here we report the main technical advances for the studies of transuranium compounds. We present the Am $T_c(p)$ diagram under 1 K and critical field H_c with pressure assuming a possible change of superconductivity from type I to type II. Pressure results on the recent discovered plutonium based superconductors PuCoGa_5 [4] and PuRhGa_5 indicate a surprising important robustness vs. mechanical constraints reinforcing the d-wave superconductivity scenario as NQR results stress it. But their Non Fermi Liquid ($r \sim T^{1.34}$) is still observed up to pressure close to 20 GPa. Their Neptunium counterparts present a clear magnetism (AFM) reinforced under pressure in the case of NpCoGa_5 . Finally, recent study of other AnCoGa_5 indicate a non magnetic ground state ($\text{An}=\text{U}, \text{Am}$).

連絡先 物理学専攻 大貫惇睦 (5368)