Abstract submitted to the
ARW Workshop on Correlated Thermoelectrics:
Properties and Applications of Thermoelectric Materials
September 20 - 26, 2008 Hvar, Croatia

Thermoelectric properties of transuranium-based unconventional superconductors

K. Gofryk[1], J-C. Griveau[1], E. Colineau[1], K. Behnia[2], J. Rebizant[1], R. Caciuffo[1]

[1] *European Commission, Joint Research Centre, Institute for Transuranium Elements, Postfach 2340, 76125 Karlsruhe, Germany*

[2] *Laboratoire de Physique Quantique (UPR5-CNRS), ESPCI, 10 Rue de Vauquelin, 75005 Paris, France*

Submitted : 31.05.2008

Keywords : transuranium intermetallics, strong electronic correlations, superconductivity

Transuranium intermetallics show a large variety of exotic behaviors that in most cases come from $5f$–ligand hybridization. Physical phenomena like long–range magnetic ordering, heavy–fermion ground state, and/or "non-Fermi liquid" behavior raised a great interest to the study of physical properties of these systems. Recently, this interest was even increased with the discovery of unconventional superconductivity in $PuCoGa_5$, $PuRhGa_5$, and very recently in $NpPd_5Al_2$. It has been found that these phases present d–wave superconductivity ($T_c \sim$ 5-18 K) and heavy-fermions features ($\gamma \sim$ 100-200 mJ/mol K^2) that may be at the origin of the superconductivity. To shade more light on the physical properties in these intermetallics we have examined thermoelectrical properties of $PuCoGa_5$ and $NpPd_5Al_2$. For both compounds, the Seebeck coefficient shows negative values in the whole temperature range. At T_c the thermopower exhibits a sharp transition to a zero value as expected for superconducting state. The overall shape and the magnitude of the Seebeck coefficient observed for $NpPd_5Al_2$ and $PuCoGa_5$ ($|S| \sim$ 20-30 $\frac{\mu V}{K}$) is characteristic of systems with strong electronic correlations. The experimental data were analyzed in terms of phenomenological models and compared to those reported in the literature for similar materials.