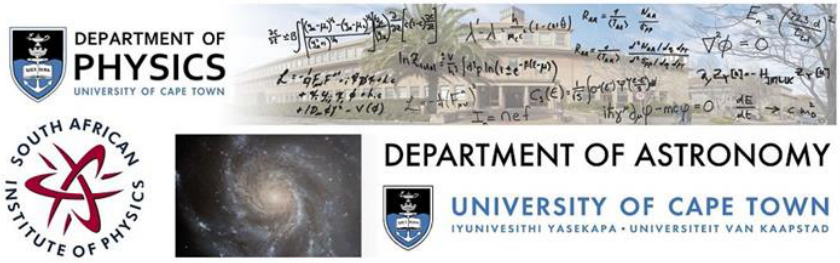

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Interplay of antiferromagnetic and Kondo effect in Ce₈Pd₂₄Al

Tuesday, 5 July 2016 16:10 (1h 50m)

Abstract content
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The suppression of antiferromagnetic (AFM) order and Kondo effect in Ce₈Pd₂₄Al with the dilution of Ce with La is investigated by means of magnetic susceptibility, χ(T), magnetization, M(μ₀H), electrical resistivity, ρ(T), magnetoresistivity, MR, thermoelectric power, S(T), and thermal conductivity, λ(T) measurements. X – ray diffraction studies indicate a cubic AuCu₃ – type crystal structure for all compositions on the alloys series (Ce_{1–x} La_x)₈Pd₂₄Al. At high temperature, χ(T) follows the paramagnetic Curie – Weiss behavior with negative paramagnetic Weiss temperatures θ_p and effective magnetic moment μ_{eff} values in close agreement with the value of 2.54 μ_B expected for free Ce³⁺ - ion. The low temperature dc χ(T) data show an AFM anomaly associated with a Néel temperature T_N which decreases almost linearly from 4.2 K for x = 0 to 2.9 K for x = 0.2 alloys. For alloys in the concentration range of $0 \le x \le 0.3$, ρ(T) is characterized by a coherent Kondo lattice scattering with a well-defined ρ(T) maximum at T_{max} = 9 K to 5.1 K for compositions in the range $0 \le x \le 0.3$, while incoherent single – ion Kondo scattering prevail for the $x \ge 0.4$ alloys. MR measurements on Ce diluted alloys are analyzed based on the calculations by Schlottmann for the Bethe – ansatz in the frame of the Coqblin – Schrieffer model and yields values of the Kondo temperature T_K and the effective moment of the Kondo ion μ_K. The decrease in T_K and T_{max} is described by the compressible Kondo lattice model. S(T) measurements are interpreted within the phenomenological resonance model giving values of the characteristic temperature T_{CEF} associated to crystal – electric field (CEF) effect. λ(T) data increase linearly with temperature from low temperature with T, while the reduced Lorentz number L/L₀ increase upon cooling and exhibit maxima at low temperature which decrease in magnitude with increased La content x.

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