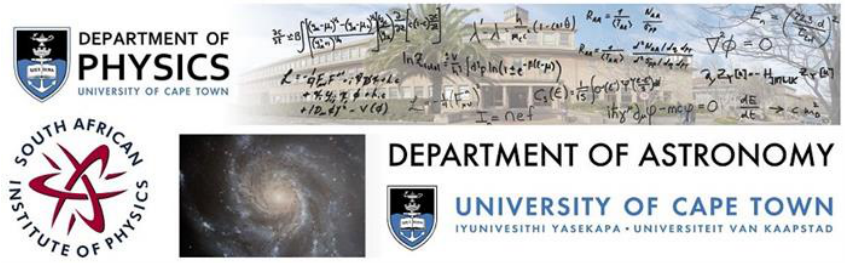

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Ce_{1-x}La_xCu₄Al as a case study for the investigation of Ce 4f wave function evolution from a coherent to a local Kondo effect

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

Abstract content
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CeCu₄Al is a heavy fermion system as well as a dense Kondo lattice, where long-range antiferromagnetic correlations emerge as a result of the strong hybridization between the Ce 4f and conduction electrons. The gradual replacement of Ce by La in the diluted series Ce_{1-x}La_xCu₄Al leads to an increase of the lattice parameters due to the larger ionic radius of La, which results in the gradual decrease of the Ce 4f hybridization strength. Consequently, the Kondo exchange coupling goes from being fully coherent towards a local/incoherent on-site effect as the La content increases.

We have used Ce_{1-x}La_xCu₄Al as a case study for the investigation of the changes in the electronic structure during the coherent-to-incoherent transition of the character of the Ce 4f wave function. We have exploited synchrotron-based x-ray absorption and (resonant) photoemission spectroscopies as ideal probing tools of the dual character of the 4f electrons and the extent of the 4f hybridization.

Among other findings, our results show that, while the incoherent part of the Ce 4f wave function is virtually unmodified throughout the series, the effect of La doping is to suppress the coherent Kondo resonance peak at the Fermi level, as well as to shift both the Kondo resonance peak and its spin-orbit counterpart towards the Fermi level. This is in agreement with the trend found in thermoelectric power measurements, and provides the electronic structure fingerprint of the effects of the fine-tuning of the 4f electron hybridization on the Kondo lattice properties in this series of diluted alloys.

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