Magnetic phase separation in $Eu_{1-x}Ca_xB_6$

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The magnetic properties of $Eu_{1-x}Ca_xB_6$ ($0 \leq x \leq 0.26$) single crystals have been studied in the wide range of temperatures (1.8-300 K) and magnetic fields (up to 5 T). The effective magnetic moment of Eu^{2+} was found to decrease from the free ion value $\mu_{\text{eff}} \approx 7.93\mu_B$ to $\mu_{\text{eff}} \approx 7.3\mu_B$ (μ_B - Bohr magneton) when Ca doping increases crossing the critical concentration of metal-insulator transition (MIT) $x_c \sim 0.2$.[1] At the same time, a universal behavior of magnetic susceptibility $\chi(T) \propto (T\text{-}\Theta)^{\alpha}$ (α=1.5) was observed near the Curie temperature in the paramagnetic phase of both metallic ($x<x_c$) and dielectric ($x>x_c$) compositions of $Eu_{1-x}Ca_xB_6$. The anomalous magnetic properties of the Ca-doped compounds are discussed in terms of the magnetic and electronic phase separation realized in the vicinity of the concentration driven quantum MIT.[2]

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[1]V. Glushkov et al., JETP **111**, 246 (2010).
[2]V.M. Pereira et al., Phys. Rev. Lett. **93**, 147202 (2004).