Equal volume dilution effect of $CeRu_2Al_{10}$

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Orthorhombic $YbFe_2Al_{10}$-type $CeRu_2Al_{10}$ is a Kondo semiconductor and undergoes a mysterious phase transition at $T_0 \sim 27$ K.[1] Tanida *et al.* examined nonmagnetic substitution system $Ce_{1-x}T_xRu_2Al_{10}$ (T=La, Y), and found that x dependence of T_0 is quite different between La- and Y-substitution.[2] The reason for the difference is assumed to be due to the difference of ionic radii, where the ionic radii of La (Y) is larger (smaller) than that of Ce. In this work, we present equal volume dilution system $Ce_{1-x}(La_{0.63}Y_{0.37})_xRu_2Al_{10}$ in addition to th above La and Y systems studied mainly by the electrical resistivity ρ for the single crystals grown by the Al-self flux method.
The $\rho(T)$ for $Ce_{1-x}La_xRu_2Al_{10}$, $Ce_{1-x}Y_xRu_2Al_{10}$ and $Ce_{1-x}(La_{0.63}Y_{0.37})_xRu_2Al_{10}$ roughly resemble one another. The $\rho(T)$ for the La-, Y- and $La_{0.63}Y_{0.37}$- substituted system turn into suddenly metallic behavior between x=0.5 and 0.7, x=0.7 and 0.9, and x=0.7 and 0.9. x=0 and 0.1 for all the systems show conventional metallic behavior and and Kondo effect, respectively. Here Kondo temperature increases with Y content as expected from impurity Kondo effect. This suggests that Kondo effect and semiconducting behavior related with each other.

[1]T. Nishioka *et al.*, J. Phys. Soc. Jpn. **78**, 123705 (2009).
[2]H. Tanida *et al.*, J. Phys. Soc. Jpn. **79**, 043708 (2010).