

Transport properties of $\text{La}_{1-x}\text{Ce}_x\text{Cu}_4\text{Al}$ alloys

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We report on the transport properties (thermal conductivity, electrical resistivity) of $\text{La}_{1-x}\text{Ce}_x\text{Cu}_4\text{Al}$ ($0 \leq x \leq 1$) alloys. The hexagonal CeCu_5 -type structure was confirmed by the powder X-ray diffraction technique. Susceptibility measurements give effective magnetic moments in a good agreement with the Ce^{3+} ion value. The analysis of the magnetic resistivity at low temperatures revealed that only CeCu_4Al shows a maximum in $\rho(T)$ typical of the Kondo lattice. The measured thermal conductivity of the $\text{La}_{1-x}\text{Ce}_x\text{Cu}_4\text{Al}$ compounds increases with increasing temperature. The scattering of electrons and phonons on the lattice imperfections is elastic and this mechanism is most important at low temperatures. In contrast, the phonon-electron and phonon-phonon interactions may have elastic as well as inelastic character and they are described by the normal and the Umklapp processes. A large reduced Lorentz number L/L_0 indicates that the dominant heat carries are phonons, and the spin scattering of charge carries does not play a significant role.

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