Enhanced thermoelectric power factors in the $Ce(Cu_{1-x}Ni_x)_2Si_2$ and $CeNi_2(Si_{1-y}Ge_y)_2$ alloys

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In the presence of hybridization of the f states with the conduction electrons Ce-based compounds can show large peaks in the temperature dependence of the Seebeck coefficient, which makes them interesting materials for applications. The Seebeck coefficient, electrical resistivity, and thermal conductivity of the bulk, arc-melted, single phase samples of $Ce(Cu_{1-x}Ni_x)_2Si_2$ and $CeNi_2(Si_{1-y}Ge_y)_2$ alloys were measured over the temperature range of 2 K to 300 K. All the samples exhibited a positive Seebeck coefficient, which reaches up to $\sim$50 μV/K at 150 K and it can be shifted up to 300 K by appropriate doping. The thermoelectric power factor, $PF = S^2/\rho$, reached a maximum of $1.4\times10^{-3}Wm^{-1}K^{-2}$ at 290 K and $1.1\times10^{-3}Wm^{-1}K^{-2}$ at 110 K for x = 0.25 and y = 0.75, respectively. For selected representatives of the studied series thermoelectric properties have been measured up to 1000 K. The wide temperature range enabled a plausible determination of the magnetic and nonmagnetic contributions.