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Superconductivity and structural variation of the electron-correlated layer systems $Sr(Pd_{1-x}T_x)_2Ge_2$ (T = Co, Ni, or Rh; $0 \leq x \leq 1$)[1]
H.C. KU, J.W. WANG, I.A. CHEN, Y.B. YOU, C.Y. LIN, C.H. HUANG, S.J. WANG, Department of Physics, National Tsing Hua University, Y.Y. HSU, Department of Physics, National Taiwan Normal University — Superconductivity variations in the pseudoternary $Sr(Pd_{1-x}T_x)_2Ge_2$ layer system (Pd($4d^8$), T = Co($3d^7$), Ni($3d^8$), or Rh($4d^7$); $0 \leq x \leq 1$) are reported. For the $BaFe_2As_2$-type tetragonal structure, the degenerate nd^7 or nd^8 orbital of transition metal T is splitted by c-axis squeezed TGe_4 tetrahedral crystal field in the T-Ge layer. For the isoelectronic $Sr(Pd_{1-x}Ni_x)_2Ge_2$ system, superconducting transition temperature T_c decreases monotonically from 3.12 K for $4d$-band $SrPd_2Ge_2$ to 0.92 K for $3d$-band $SrNi_2Ge_2$, where major contribution of conduction electrons was from the half-filled dispersive 3D-like upper-lying $nd_{xz,yz}$ bands. For the $Sr(Pd_{1-x}Rh_x)_2Ge_2$ system, T_c decreases to 2.40 K with 25% of $4d^7$ Rh substitution. For the $Sr(Pd_{1-x}Co_x)_2Ge_2$ system, T_c decreases sharply to 2.58 K with only 3% of $3d^7$ Co substitution. The lower T_c of the present electron-overdoped (nd^7 or nd^8) compound is due to dispersive 3D-like $nd_{xz,yz}$ conduction bands with weak electron correlation.

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