Pressure-induced novel superconductivity and heavy electron state in rare earth compounds

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In rare-earth compounds, various kinds of electronic ground states such as magnetic ordering, heavy fermion, and unconventional superconductivity are realized as a result of the competition between the RKKY interaction and the Kondo effect. We have carried out the electrical resistivity measurements under high pressures on $CePd_5Al_2$, $CeIrGe_3$ and YbT_2Zn_{20} (T: Co, Rh, Ir) in order to investigate quantum criticality and superconductivity. An antiferromagnet $CePd_5Al_2$ with a Néel temperature T_{N1}=4.1K, which is an isostructural family of a heavy fermion superconductor $NpPd_5Al_2$, shows superconductivity around the critical pressure $P_c \simeq$ 10GPa. $CeIrGe_3$ with T_{N1}=8.7K, which crystallizes in the $BaNiSn_3$-type tetragonal structure without inversion symmetry, also shows superconductivity above 20 GPa, which shows a huge upper critical field for $H \parallel$ [001].[1] On the other hand, $YbIr_2Zn_{20}$ exhibits a heavy fermion state exceeding 10 J/(K^2· mol) around $P_c \simeq$ 5.2 GPa.[2]

[1]F. Honda, *et al.*, Phys.Rev.B **81**, 140507(R) (2010), [2]F. Honda, *et al.*, J.Phys.Soc.Jpn. **79**, 083709 (2010)

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