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Heavy fermion superconductivity under strong orbital fluctuations in PrV_2Al_{20} YOSUKE MATSUMOTO, MASAKI TSUJIMOTO, TAKAHIRO TOMITA, AKITO SAKAI, SATORU NAKATSUJI, ISSP, Univ. of Tokyo — Novel quantum phases formed in the vicinity of a magnetic quantum critical point (QCP) have been studied extensively in $4f$ based intermetallics. On the other hand, it is an interesting open question what types of ground state emerges in the vicinity of a QCP of orbital orderings if the f electrons' orbital degrees of freedom strongly hybridize with conduction electrons. In order to study this, it is important to choose a material with purely orbital degrees of freedom in the ground state. In addition, the material should be clean and the hybridization should be large. Recent our studies have revealed that PrT_2Al_{20} (T = Ti, V) are ideal systems. Both systems have the nonmagnetic cubic Γ_3 crystal electric field doublet. In addition, the hybridization is strong as is evident in many physical properties. We found that both exhibit heavy fermion superconductivity inside the multipole ordering phases. Especially, in the case of PrV_2Al_{20}, the effective mass is highly enhanced ($m*/m_0 \sim 140$) even at ambient pressure, revealing even stronger hybridization. This observation indicates the first realization of the novel superconductivity arising from the orbital fluctuation of the f electrons at ambient pressure, suggesting a proximity to an orbital QCP.

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