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Pressure-induced metal-insulator transition in $\text{PrFe}_4\text{P}_{12}$

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We have studied the electrical resistivity in the skutterudite compound $\text{PrFe}_4\text{P}_{12}$ under high pressure. An antiferro-quadrupole ordering temperature, T_Q decreases monotonously with increasing pressure up to 2.4 GPa. However at 2.4 GPa, the increase of the resistivity (ρ) appears below T_Q . T_{MI} , where rapid ρ starts to increase, moves to higher temperature with increasing pressure; The metal-insulator (M-I) transition appears under high pressure. This M-I transition is suppressed easily by applying field. The observed Kondo effect and field-induced heavy-fermion state at high pressure suggest that the quadrupolar interactions survive even in the insulator phase.

In order to clarify the mechanism of M-I transition in this compound, further investigations are required. The NMR measurement will be powerful tool to investigate the relation between the quadrupole ordering and the M-I transition. The pressure dependence of carrier will be investigated by the Hall effect measurement. In addition to the study of $\text{PrFe}_4\text{P}_{12}$, the pressure-induced transition will be researched in other skutterudite compounds.

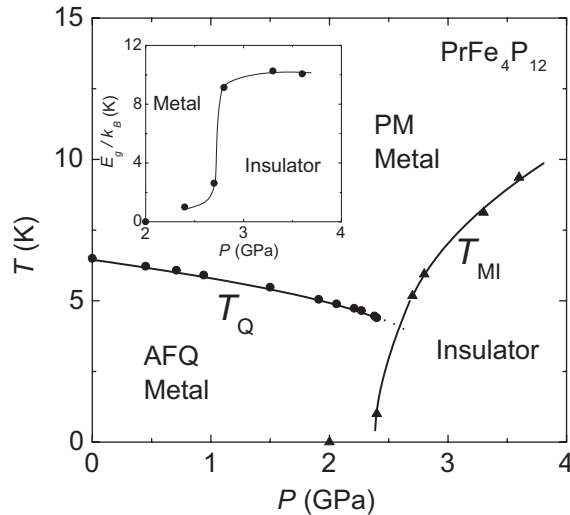


Figure 1: $P - T$ phase diagram. Inset shows the pressure dependence of E_g / k_B .