Intriguing physical properties of the As-based filled skutterudites

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First-ever single crystals of As-based filled skutterudites have been grown by a high-pressure Cd/As-flux method. Sufficiently large specimens enable a comprehensive research of their ground state. While low-temperature physical properties of LaRu\textsubscript{4}As\textsubscript{12} (superconductivity), CeRu\textsubscript{4}As\textsubscript{12} (non-Fermi-liquid behavior), PrFe\textsubscript{4}As\textsubscript{12} (complex ferromagnetic state), and PrOs\textsubscript{4}As\textsubscript{12} (multiple low-\(T\) ordered phases) will be briefly reviewed, a magnetic-field-driven metal-insulator transition in CeOs\textsubscript{4}As\textsubscript{12} will be discussed in detail: Below about 130 K, the electrical resistivity increases by two orders of magnitude upon cooling to 65 mK. At the lowest temperatures (\(T < 3\) K), both the electrical resistivity and Hall resistivity are significantly suppressed by a magnetic field \(B \simeq 3\) T. Whereas these effects depend on the magnetic-field orientation, the further increase of \(B\) does not significantly affect the charge transport in CeOs\textsubscript{4}As\textsubscript{12}. Remarkable that its zero-field thermoelectric power displays a broad peak at around 2 K. Additionally, the Sommerfeld coefficient to the heat capacity as small as 7 mJK\textsuperscript{-2}mol\textsuperscript{-1} is barely influenced by \(B \leq 9\) T. Finally, a nonmagnetic or weakly magnetic ground state is inferred from the magnetization data. These experimental findings for CeOs\textsubscript{4}As\textsubscript{12} apparently point at an energy-gap formation due to a hybridization between 4\(f\) electrons and conduction electrons.

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