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Seebeck and Nernst coefficients of Heavy-Fermion metals in the zero-temperature limit

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The Seebeck coefficient of a metal is expected to display a linear temperature-dependence in the zero-temperature limit. Until very recently, however, the magnitude of this term was not put under systematic scrutiny. A striking correlation between this term and the electronic specific heat in different families of metals was recently noticed[1, 2]. A dimensionless ratio relating these two signatures of mass enhancement contains interesting information about the ground state of each system. Scrutinizing this ratio allows tracking non-trivial physics, which includes the emergence of a giant Nernst coefficient.
The mixed state of a superconductor is known to display a large Nernst coefficient due to the movement of superconducting vortices in presence of a thermal gradient. In a simple metal, on the other hand, the Nernst effect is very small. We present our recent studies of Nernst coefficient in several Heavy-Fermion metals including $CeCoIn_5$[3, 4], UPt_3, URu_2Si_2[5, 6], $CeRu_2Si_2$[4] and $PrFe_6P_{12}$[7]. The results point to another (hitherto unnoticed) source of transverse thermoelectricity in the context of strong correlation. By linking the magnitude of the the Nernst coefficient to other transport properties in a Boltzmann picture, we will argue that a giant Nernst signal is expected for a dilute liquid of heavy quasi-particles with a long mean-free-path. This is in conformity with what is experimentally observed in the ordered states of URu_2Si_2 and $PrFe_6P_{12}$.

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