MAGNETISM AND ELECTRONIC STRUCTURE OF ACTINIDE CHALCOGENIDES

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The magnetism of the light actinide chalcogenides from U up to Am is largely determined by the electronic structure of these materials and the degree of f localization. The U chalcogenides are simple trivalent $5f^3$ ferromagnetic metals with eV wide 5f bands. The Np chalcogenides NpS and NpSe are trivalent, have a $5f^4$ configuration and they exhibit type II antiferromagnetic ordering. We still have a relatively wide 5f band and f-d hybridization. According to the Luttinger theorem materials with an odd f+d count, here 5, should not exhibit a hybridization gap. Nevertheless the resistivity shows activated behavior. A gap appears in an antiferromagnet with a magnetic unit cell twice the chemical cell and the f-d count is even again. Nonmagnetic NpTe indeed has no activated resistivity. The Pu chalcogenides are intermediate valent and with an even f-d count (6) they have hybridization gaps in the meV range and f band widths in the tens of meV. The magnetism is of the Pauli type but with an enormous susceptibility. Finally in AmTe we have a divalent $5f^7$ configuration, but with a narrow 24 meV half filled 5f band, it is thus a heavy fermion with $m^* \cong 330$ m and shows an even stronger Pauli susceptibility than PuTe. If the assignment is correct, 5f localization is not yet achieved in the Am chalcogenides but only in the Cm chalcogenides. Instead localization in the actinide metals is claimed already in Am.

Abstract Category.

4. Rare Earths and Actinides, Alloys and Compounds

Invited talk (plenary)

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