MAGNETOVOLUME EFFECT IN URANIUM COMPOUNDS

G.E. Grechnev[a], A.S. Panfilov[a], I.V. Svechkarev[a], O. Eriksson[b], B. Johansson[b] and M. Mihalik[c]

[a]B. Verkin Institute for Low Temperature Physics, Kharkov, 310164, Ukraine
[b]Condensed Matter Theory Group, Department of Physics, University of Uppsala, Box 530, S-751 21 Uppsala, Sweden
[c]Institute of Experimental Physics, 043 53, Košice, Slovakia

9.7 cm

This contribution aims at finding an origin of pronounced volume effect on magnetic susceptibility χ in uranium compounds UCo_2 and UX_3 (X= Al, Si, Ga, Ge), situated well below and above the critical Hill limit, respectively. The volume dependent band structures of UX_3 and UCo_2 have been calculated in an external magnetic field by employing a relativistic full–potential LMTO method with the Zeeman term included for calculations of field–induced spin and orbital moments. The calculations have brought out strong p–f (for UX_3) and d–f (for UCo_2) hybridization, giving narrow bands of itinerant f states, as well as large and competing field–induced orbital and spin moments. The calculated volume derivatives of the induced moments appeared to be in agreement with the volume trends revealed for χ in UX_3 compounds, as well as with $\mathrm{dln}\chi/\mathrm{dln}V$ derivatives evaluated from our experimental studies of the pressure effect on χ in UCo_2 and UGa_3. The volume effect is found to be more pronounced for the induced orbital magnetic moments, due to the rapid quenching of these moments with increasing width of $5f$ bands under pressure. A large volume effect on the spin magnetic moment can not be entirely attributed to the volume dependence of the density of states at E_F.

13.4 cm

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Corresponding author :
G.E. Grechnev

Address for correspondence :
B. Verkin Institute for Low Temperature Physics,
47, Lenin's pr., Kharkov, 310164, Ukraine

Email address :
grechnev@ilt.kharkov.ua