Volatilization behavior of transactinides from metal surfaces and melts

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Volatilization properties of elements with the atomic numbers Z=104 to 116 are determined on the basis of empirical relations. These empirical correlations can be deduced from the analysis of thermochemical data of elements in the periodic table and their relations to the material constants .Structure specific connections are shown to exist between the electron densities at the "Wigner-Seitz" cell borders [1] of metals and the specific surface energies of solid metals with hexagonal, face-centred cubic, body-centred cubic and rhombohedral lattices. Analogously, structure specific relations can be found between the standard enthalpies of the gaseous monoatomic metals and their surface energies. Linear correlations with exceptionally high correlation coefficients are observed between the standard sublimation enthalpies of isotypic metals in the dimeric state and the surface energies [2]. Volatilization properties (see Fig. 1-5) have been deduced for the transactinoides on the basis of these established relations, applying predicted structures and electron densities of of transactinides.

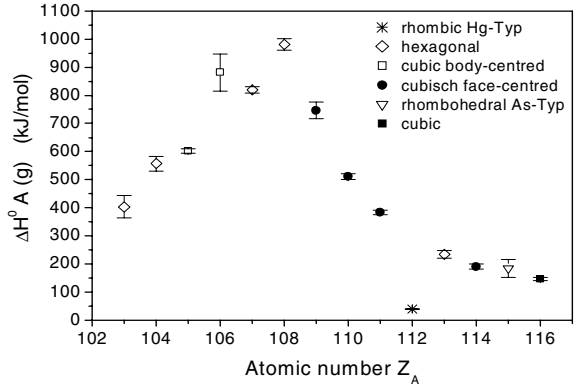

Fig. 1: Standard enthalpies of monoatomic elements

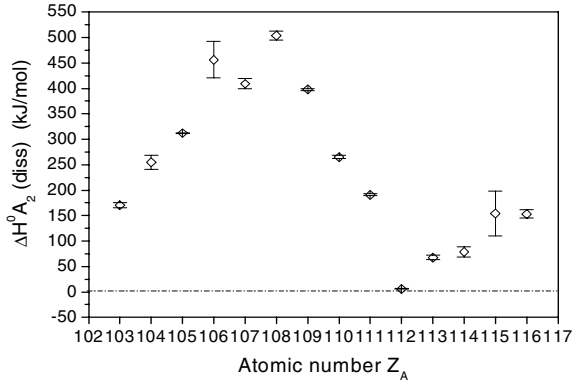

Fig.2: Standard dissociation enthalpies of dimers

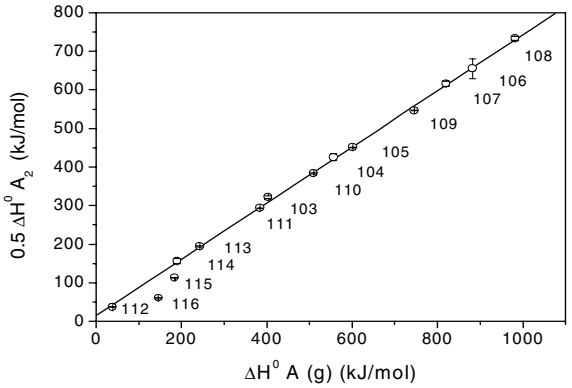

Fig.3: Comparison of sublimation enthalpies in the mono-atomic and the dimeric state

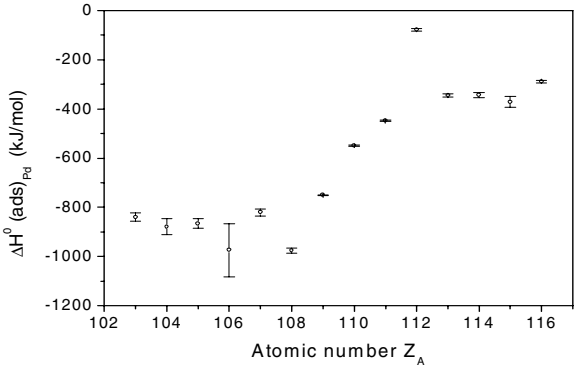

Fig.4: Adsorption enthalpies on Palladium

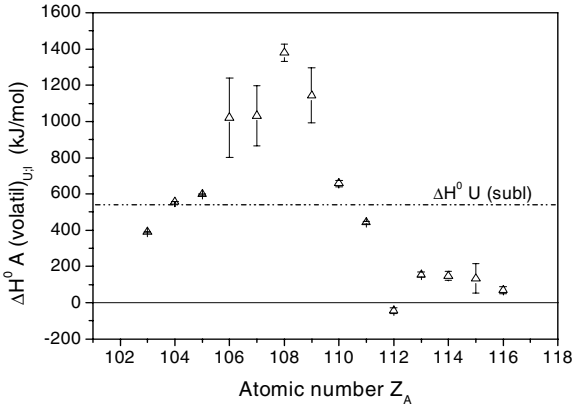

Fig.5: Enthalpies of volatilization from Uranium melt

References

[1] B.Eichler, Metallchemie der Transaktinoide, PSI Bericht Nr. 00-09, Dezember 2000,ISSN 1019-0643.

[2] B. Eichler, Verflüchtigungsverhalten der Transaktinoide von Metalloberflächen und aus Schmelzen PSI Bericht Nr. 03-01 Januar 2003, ISSN 1019-0643.