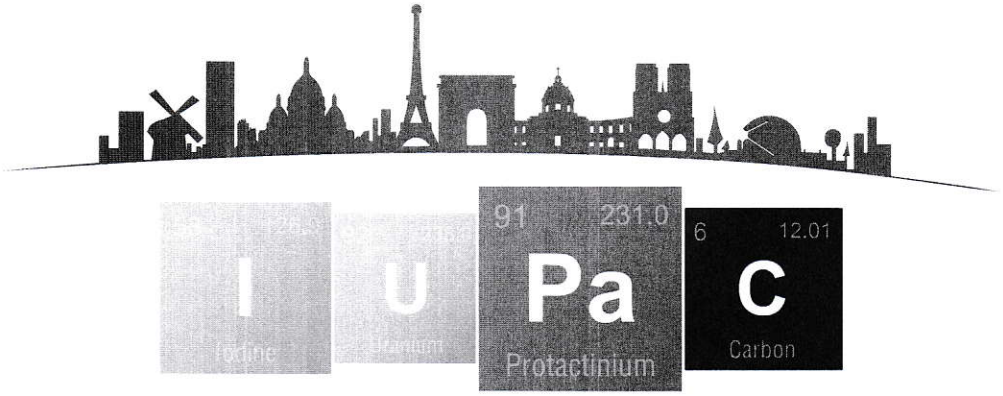

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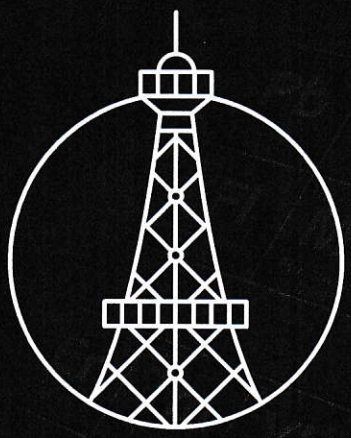
ABSTRACT BOOK



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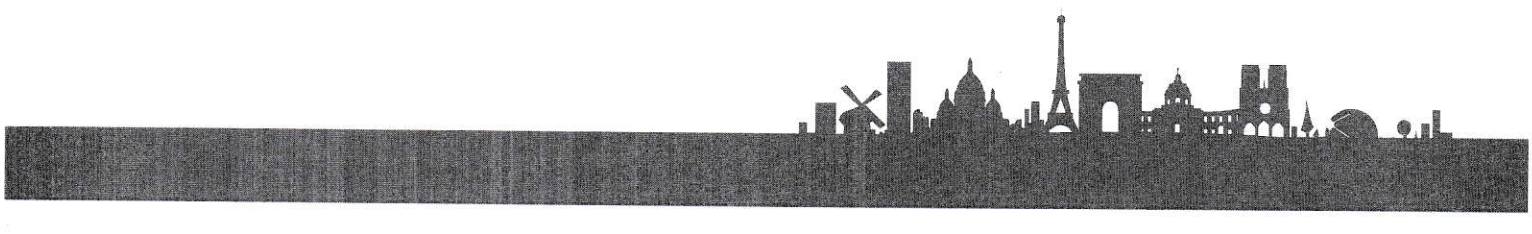

CL367BIS

RELATIONSHIP OF THE PHYSICOCHEMICAL CONSTANTS WITH PERIODIC LAW

3. The Periodic Table at 150

#CL367BIS

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Abstract

Relationship of the Physicochemical Constants with Periodic Law

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A strict relationship between the enthalpy of formation, melting point and the atomic numbers of components in the $A^{III}B^{V}$ phases was established. The proposed model was used for the critical assessment of the thermodynamic properties of isostructural compounds such as the reduced enthalpy, standard entropy, reduced Gibbs energy using the sum of the atomic numbers ($Z=Z_A+Z_B$).

The Similarity Method was used for the critical analysis of specific heats for the fourth group (C, SI, Ge, Sn), $A^{III}B^{V}$ and $A^{II}B^{VI}$ isostructural phases in the solid state. The dependence of the heat capacities from 0 to 1500 K follows certain regularity. Phases with the same sum of the atomic numbers of elements (Z), such as BN (hex) Z=12 and glassy pure carbon Z=6; BP and AlN (Z=20); AlP (Z=28) and pure Si (Z=14); BAs and GaN (Z=38); AlAs and ZnS (Z=46); AlSb, GaAs, InP (Z=64) and pure Ge (Z=32); GaSb, InAs, and CdSe (Z=82); InSb, CdTe (Z=100) and pure grey Sn (Z=50); have the same heat capacity experimental values of the solid state within the experimental uncertainty.

The tetrad-effect phenomenon was established and used for the analysis, correction, and prediction of thermodynamic data for the lanthanide (Ln) compounds and the pure actinides (Ac). They are connected to the 4f-electrons of the lanthanide elements (Ln: La-Lu; their atomic numbers are 57-71) and 5f-electrons of the actinides with atomic numbers 89-102. The most sensitive to the tetrad-effect the thermodynamic functions of lanthanide and actinide compounds are standard entropies and entropies of formation because they are the most susceptible to the influence of the 4f- and 5f-electrons of the lanthanides and the actinides. We analyzed some classes of lanthanides with other elements of the Periodic Table. We use the tetrad-effect concept for the analysis and prediction of the standard entropies of the solid phases as the Ln_2X_3 (X=O, S, Se, Te). This approach can also be applicable to other classes of the Ln compounds as LnN, LnB_2, LnB_4, LnB_6, LnF_3, $LnIn_3$ and other compounds.

Keyword 1
Semiconductors (AII-BVI, AIV, AIII-BV) and lanthanide compounds
Keyword 2
thermodynamic properties
Keyword 3
entropy
Keyword 4
Debye's functions
Keyword 5
tetrad-effect