Table VII. Equilibrium Pressures at Two Concentrations for Several Temperatures

Temperature, °C	Equilibrium Pressure (Mm of Hg)	
	100 Ppm	1 Ppm
500	5.1×10^{-4}	5.1×10^{-8}
600	4.2×10^{-3}	4.2×10^{-7}
700	1.2×10^{-2}	1.2×10^{-6}

ard partial molar heat of solution of hydrogen for the α -zirconium phase, while a value of $-22,875$ cal per gram-atom was found for the δ -hydride phase. A value of -15.0 E.U. per gram-atom was found for the standard partial molar entropy of solution of hydrogen in the α -zirconium phase, while a value of -17.0 E.U. per gram-atom was found for the δ -hydride phase. The standard partial molar free energy of hydrogen atoms in the α -phase was $-2,605$ cal per gram-atom and in the δ -phase was $-9,734$ cal per gram-atom.

4—To obtain the temperature dependence of these thermodynamic quantities, a statistical thermodynamic analysis was made of the vibration modes of the hydrogen atoms in the two structures as a function of temperature. The thermodynamic quantities involved in the expressions for the solubility, terminal solubilities, and decomposition pressures were calculated for the temperature range of 0° to 700°C . Good agreement was found with the experimental results.

5—The standard partial molar free energies of solution of hydrogen in the α and δ -phases were used to explain the exothermic nature of the overall solubilities and the endothermic nature of the terminal solubilities.

6—The practical problem of removal of hydrogen from the metal at high temperatures and at high vacuum was discussed, using the decomposition pressure equation.

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Technical Note

X-Ray Crystallographic Data on As_2Te_3

by Joseph Singer and Chester W. Spencer

A PARTIAL phase diagram for the As-Te system is given in Hansen.¹ The only compound reported is As_2Te_3 , melting at 362°C . Stoichiometric quantities of reagent-grade elements were reacted in evacuated quartz and directionally cooled. The resulting ingot consisted of very thin threadlike crystals from which only very small single-crystal fragments were isolated. A powder diffraction diagram disclosed nonisomorphism with the analogous V-VI compounds insofar as these have been reported; Sb_2S_3 , As_2S_3 , Bi_2S_3 , and Bi_2Te_3 data in the ASTM index of powder patterns, together with the single-crystal data on Sb_2Se_3 ² were used for the com-

parison with the observed spacings. Single-crystal data confirmed the uniqueness of the As_2Te_3 structure.

Single-crystal Weissenberg diagrams have so far yielded the following data: As_2Te_3 is monoclinic, space group $C-m$ ($0k0$ data still lacking), $a = 14.4\text{\AA}$, $b = 4.05\text{\AA}$, $C = 9.92\text{\AA}$, $\beta = 97^\circ$. The cell volume is about $580\text{\AA}^3$. The set of isomorphous orthorhombic cells of Sb_2Se_3 , Sb_2S_3 , and Bi_2S_3 are apparently related to As_2Te_3 in having one lattice constant close to 4.0 and with cell volumes as large as $540\text{\AA}^3$. Assuming $Z = 4$ for As_2Te_3 also, the density is calculated as 6.1 which agrees well with a roughly determined value of 6.0 .

A complete structure analysis is under way.

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² R. W. G. Wyckoff: *Crystal Structures*. New York. Interscience Publishers Inc.