NOTES

The Vapor Pressure of Americium Metal

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The vapor pressure of americium has been measured over the temperature range 1103 to 1453°K., by the same method and with the same equipment described elsewhere for PuF_3 and AmF_3.[1,2] Measurements were made independently on two samples of metal in which extreme care was exercised in the preparation, cleaning and loading of the samples, in an effort to prevent the formation of an impervious oxide "skin" which is known to cover molten americium metal upon exposure to trace amounts of oxygen. Fairly self-consistent data were obtained in the two runs, using about a milligram of metal in each case. However, it was not possible to make critical examinations of the contents of the effusion vessels after firing. Owing to the fact that some degree of contamination was inescapable, and to the somewhat unpredictable behavior of small samples of liquid americium with respect to tantalum effusion vessels, the experiments were felt to be insufficiently controlled to regard the results as final. The measurements are presented as preliminary values—the first which have been obtained on pure metallic americium—with the expectation that they will be re-examined at a later date. All data used in our calculations were obtained at temperatures above the melting point of the metal, and therefore refer to vaporization from the liquid state.

The two runs resulted in two linear curves of $\log_{10} p_{(\text{mm})}$ *vs.* $10^4/T$, separated vertically by about 10% of the vapor pressure and differing in slope by about 1%. Average scattering of the points about each curve was ±7% of the vapor pressure.

The equation for the best straight line is: $\log p = 7.563 - 13{,}162/T$. If a ΔC_p of vaporization from the liquid of -2 cal. mole^{-1} deg.$^{-1}$ is assumed, the best fit is obtained by: $\log p = 11.092 - 13{,}700/T - \log T$. The free energy of vaporization equation is: $\Delta F = 62{,}690 - 50.76\,T - 2.303(-2)T \log T$. Other calculated thermodynamic quantities are: $\Delta H_{1273} = 60.2$ kcal. mole^{-1}; $T_B = 2880$°K.; $\Delta H_{2880} = 57$ kcal. mole^{-1}; $\Delta S_{2880} = 20$ cal. mole^{-1} deg.$^{-1}$. No attempt is made to state the error in each quantity, owing to the nature of the uncertainty in the measurement. The value 20 for ΔS_{2880} is distinctly low, by comparison not only with Trouton's rule but also with similar constants for other metals of comparable volatility. Relatively small errors in our data would suffice to create such a discrepancy upon extrapolation to the boiling point.

An earlier estimate of the vapor pressure of americium by Erway and Simpson,[3] giving considerably higher pressures, was obtained from observations of the volatilization of americium from a dilute solution in plutonium. It was assumed that the two metals form an ideal solution. Since americium[4] and plutonium[5] differ substantially in their metallic properties, this assumption is open to some question.

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Some New Intermetallic Compounds with the "β-Wolfram" Structure

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A recent paper by Hägg and Schönberg[1] has shown that "β-wolfram" is actually wolfram oxide W_3O, with the W and O atoms randomly distributed among the two- and sixfold positions of the A15 type[2] structure. Many intermetallic compounds with the A15 structure are now known. In all of these the atoms are ordered. Several have been found to be superconducting above 1.2°K.[3] V_3Si[4] has a superconducting transition temperature between 16.9 and 17.1°K., which is one of the highest known. The compounds to be described in this paper were discovered in the search for superconductors with high transition temperatures. One of these, Nb_3Sn, has the highest transition temperature, 18.05 ± 0.1°K., known to date.[5]

The new compounds with the β-W structure are Nb_3Sn, Nb_3Os, Nb_3Ir, Nb_3Pt, Ta_3Sn and V_3Sn. The superconducting transition temperatures of the niobium compounds are[6] 18.0, <1.0, 1.7 and 9.2°K., respectively. The transition temperature of Ta_3Sn[5] is 6°K. and of V_3Sn, 7°K.

Experimental

The preparation of the tin compounds was described earlier.[5] The others were prepared by mixing the metals in proper proportion and causing them to react using an arc furnace in helium atmosphere. X-Ray powder photographs were taken using Cu K radiation and Straumanis type Norelco camera with 114.6 mm. diameter. Intensities of the lines were estimated visually. The Norelco diffractometer was used to determine X-ray intensities of the Nb_3Ir and Ta_3Sn samples mainly for corroboration. The new specimen spinner which rotates a circular disc sample in the

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