DENSITY AND SURFACE TENSION OF ALLOY URANIUM–CHROMIUM IN LIQUID PHASE

Kachalov V. V.

JIHT RAS, Moscow, Russia
ongk@mail.ru

Method of maximum pressure in gas bubble in two-capillary modification are measured density and surface tension of liquid alloy 94.2% mas. uranium–5,8% mas. chromium in the interval of temperatures $T_{\text{melt.}}$–1900 K. As method of research method of maximum pressure in gas bubble is chosen. To advantages of method well developed theory, constant updating of the surface of formed bubble during experiment relates, from given one experiment density and surface tension of under study corium receive. However at traditional execution of this method with one capillary tube a series of methodical difficulties arises. First, accuracy of measurement of surface tension is limited of accuracy of registration of the capillary tube immersing depth to corium. Secondly, it is necessary to correct for curvature of the meniscus in the crucible which is defined by boundary angle of coating with the crucible material corium and surface tension of under study substance which can change during experiment In given work two-capillary outline of method of maximum pressure in gas bubble for the first time offered in [1] is realised. Application of two capillary tubes of various diameters immersed to corium, eliminates necessity of the account of curvature of the meniscus in the crucible, and immersing depth enters amendment, size of which is small as compared with measured sizes.

At research of density of high-temperature and chemically active substances because of complexity of filling pyknometer and difficulties connected with the control of the level of corium in dilatometer, method of maximum pressure in gas bubble becomes to competitive that two the most common methods of density research.

Experimental installation and the technique of execution of measurements are described. Confidential error of received data is appreciated. Experimental data of density and surface tension of alloy uranium–chromium are received for the first time. In investigated temperatures interval properties of corium decrease linear with growth of temperature:

$$\rho \cdot 10^3 = 19.11 - 2.2215T,$$

$$\sigma = 2548.8 - 0.5960T,$$

where ρ–density in kg/m^3, σ–surface tension in mN/m, T–temperature in K.

Confidential error measuring ρ and σ are appreciated equal ± 28 kg/m^3 and ± 52 mN/m.

Reliability of experimental data received on given technique on this experimental installation, is recognised in modern reviews and reference books by results of research of density and surface tension of uranium up to temperatures 2100 K [2, 3].

It is shown that within the limits of accuracy of experimental data of density of uranium and chromium molar volume of alloy uranium-chromium is described by the equation of the type additivity

$$\nu_{\text{alloy}} = \nu_1 \chi + \nu_2 (1 - \chi),$$

ν_{alloy}, ν_1, ν_2 – molar volumes of alloy and his components, χ – molar concentration of the component.

---

1. Sudgen, S. J. J. Chem. Soc. 1922. V. 121. P. 858
2. Fokin, L. R., Liquid Uranium, Density Isobar of 1406-4500 K, Sbornik dokladov mezhvedomstvennogo seminara TF-2007 (Collection of Papers to TF-2007 Inter-departmental Seminar), Obninsk: State Scientific Center of the Russian Federation-Leipunskii Institute of Energy Physics, 2008, p. 400.
3. Thermal properties of materials of nuclear equipment / under red. P. L. Kirillov, M.: 2007.