ON THE POSSIBILITY OF THE EXISTENCE OF A DOUBLE MAXIMUM ON THE ADSORPTION ISOTHERM OF BINARY METALLIC SYSTEMS

Lesev V.N.,[*1] ***Alchagirov B.B.,***[1] ***Dadashev R.Kh.,***[2]
Kyasova O.Kh.,[1] ***Uzdenova A.N.***[1]

[1]*KBSU, Nalchik, Russia,* [2]*ChSU, Grozny, Russia*
[*]*lvn_kbsu@mail.ru*

The study of adsorption phenomena in metallic melts has a great importance for the development of the theory of surface phenomena and the practice of developing new technological processes. But analysis of the literature shows, double maximum on the adsorption isotherms of a number of binary systems are found, for example, on the isotherm of potassium adsorption in alloys with sodium (P. Pugachevich and co-workers). It turned out that the value and position of the first maximum is consistent with the theory of surface phenomena V. Semenchenko, but the explanation of the second maximum in the framework of this theory is difficult. In this regard, we consider the possibility of the existence of a double maximum on the adsorption isotherms of surface-active components in binary liquid metal melts using an example of Pb based on In, in which Pb is a surface-active component. To that end, using our own experimental data on the surface tension (ST) isotherm of the In-Pb system, we calculated the adsorption of lead on the surface of alloys for T = 573 K.

From the results of Guggenheim-Adam in the "N" - variant, it follows that the adsorption isotherm does detect two maximum at a content of 0.12 and 0.17 atomic share of Pb in the alloys with indium. Moreover, the possibility of the appearance of a double maximum on the adsorption isotherm is inherently "laid by" in the calculation formula itself, which is the product of two factors: the parabola $(x_{In}x_{Pb}) = x_{Pb}(1 - x_{Pb})$ and the hyperbolas $(d\sigma/dx_{Pb})_T$, in which the concentration x_i are expressed in atomic fractions if the normalization $x_{Pb} + x_{In} = 1$. For alloys with a surface-active component, the isotherms $d\sigma/dx$ are usually the rapidly decreasing functions of the alloy compositions, i.e. hyperbole. As a result of multiplying the coordinates of the points of intersecting parabola and hyperbola in a plane "$d\sigma/dx$–composition of alloys", and the desired maximum appear on the adsorption curve.

Therefore, calculations of lead adsorption in alloys with indium and an analysis of the Guggenheim-Adam formula themselves show the possibility of the appearance of a double maximum on the adsorption isotherms of surface-active components in binary liquid metal solutions.