The Surface Tension of Alloys of the Tin-Sodium System

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Studies of the surface tension (ST) of metal melts with additions of alkali metals in wide temperature and concentration ranges are necessary for the calculations and engineering of new chemical sources of current, for photoemission items based on compounds of alkali metals, and for the development of highly efficient heat carriers for atomic and nuclear energy, etc. The high efficiency of alkali metals at a small content in metals and multicomponent metal alloys makes it possible to modify substantially many physicochemical properties and strength characteristics [1,2]. The work critically examines the results of investigations of the surface tension of the liquid tin-sodium system and also presents the original experimental data of the authors on the concentration dependence of the ST of 31 alloys of tin-sodium system, obtained with method of a large drop on samples of increased purity Sn (99.999 %) and Na (99.995 %) for T = 573 K. The margin of error for the experimental data is ~2 %. It has been established that additions of sodium to tin significantly reduce the surface tension of the studied melts. The isotherm of the ST of Sn–Na system on the whole agrees with the known criteria of the surface activity of the components in binary systems [3,4], i.e., even the first small (to 0.06 at. %) additions of sodium (whose ST is ~200 mN/m) decrease the surface tension of liquid Sn 20 %. Using our experimental ST isotherms of Sn-Na alloys, we calculated the adsorption of Na in the N-version using the familiar Guggenheim–Adam ratio [5]. Calculations of sodium adsorption in alloys with tin have shown that there is a maximum on the adsorption curve corresponding to alloys with a content of about 1.5 at. % Na in Sn.

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