Wettability of Nickel, Tantalum, and Copper Surfaces by Sodium and Potassium Melts

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Alkali metals and their alloys have a unique combination of physicochemical properties, and they are very promising materials in science, and modern technology applications. However, an analysis of available data indicates that the wettability of solid surfaces by the alkali metals melts has been studied very little.

In this work the results of experimental research of the wettability of Ni, Ta, and Cu surfaces by the melts of Na and K in high vacuum conditions (about 10^{-8} Pa) and in the temperature range from the melting points of Na and K to 690 K are presented.

Some data on the wetting angle and the work of adhesion are given in the table.

Wetting angle, θ (degrees) and work of adhesion, W(mJ/m^2).

	Na-Ni		**Na-Ta**		**Na-Cu**			**K-Ni**		**K-Ta**		**K-Cu**	
T,K	θ	W	θ	W	θ	W	T,K	θ	W	θ	W	θ	W
470	60	292	96	174	112	122	370	80	130	52	180	80	130
570	50	303	96	165	112	116	420	78	132	50	177	78	132
620	30	336	90	180	103	139	450	70	143	48	178	77	132
640	10	352	85	194	100	148	470	20	206	30	198	76	130
670	–	–	50	287	10	346	480	10	208	10	208	75	134
690	–	–	10	342	–	–	600	–	–	–	–	10	194
T_c,K	610		630		660		T_c, K	460		460		540	

The temperature threshold of wetting, T_c, where the wetting angle abruptly decreases, has been observed for all systems. The temperature range has been found, where the work of adhesion has a minimum value. The data are discussed.