MELTING OF ANISOTROPIC GRAPHITE WITH VOLUME LIMITATION

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At the moment, graphite is considered to be the most refractory material. But there are certain limitations on the study of its thermophysical properties near the melting point. In particular, graphite melts at a pressure above 120 atmospherereseres [1], so it is not possible to observe the liquid phase when graphite is heated under atmospheric conditions. To study the phase diagram at high temperatures, unsteady methods are used, such as pulsed laser or electric current heating. Pulsed heating by current makes it possible to create an overpressure during the experiment itself due to the limitation of the volume around the sampleeres [2].

For the samples, a high-density graphite grade UPV-1T (analog HOPG) was used. Based on the results of the experiments, the values of the input energy of the beginning and the end of melting were recorded: the beginning of melting (E = 11.5 kJ/g), the end (E = 21 kJ/g). The electrical resistivity of liquid carbon is close to a constant value when its expansion is limited.

In the solid phase, before melting, the heat capacity (under conditions close to Cp) is 2 J/gK and steeply increases (by a factor of 2 J/gK) even before the melting begins. In the liquid phase (above the melting point), the specific heat decreases to 2 J/gK. The sharp increase in the heat capacity to the melting point and the sharp decrease after melting can be explained by the appearance of Frenkel's nonequilibrium pair defects in the solid phase-to ensure loss of long-range order and melting. In the liquid phase, these defects annihilate at almost the same rate (the characteristic time is 1 microsecond).

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1. N.A. Gokcen, E.T. Chang, T.M.Poston, D.I. Spencer, Determination of graphite-liquid-vapour triple point by laser heating, High Temp. Sci. 8 (1976) 81
2. Savvatimskiy A I 2013 and 2014 (second edition) Graphite melting and liquid carbon properties Publishing house Fizmatkniga Moscow (in Russian)