THERMOPHYSICAL PROPERTIES OF THE BORON CARBIDE MELT AT THE MEGABAR SHOCK PRESSURES

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Boron carbide (B_4C) combines a number of high performance characteristics, which leads to its successful use in the important applications-armored structures, nuclear power, etc.. Therefore, an extensive research literature (see [1-3] and references in them) is devoted to the study of various properties of boron carbide in the field of high pressures and temperatures, including extreme conditions of shock compression In the context of the proposed report, it should be noted that taking into account the new experimental data [1] for the region of 200-800 GPA suggests the existence of a pronounced kink of the B_4C Hugoniot caused by melting of boron carbide under shock compression in the pressure range of 95-125 GPA. This hypothesis, its rationale and development are presented in [2]. At the same time, the free energy of boron carbide and its melt is constructed as a function of its variables in the megabar range of shock pressures.

The report shows that some results of [2] can be used as the equation of state of Mie-Gruneisen. This equation of state is known to be widely used in mathematical modeling of shock wave processes and a number of thermophysical properties of the shocked materials. In the report, the key components of the Mi-Gruneisen equation for boron carbide melt are discussed. These are the volume dependences of Gruneisen coefficient, as well as potential pressure and energy functions. Calculations of the shock velocity-mass velocity, temperature, heat capacity and sound velocity along the melt of boron carbide Hugoniot are considered. The obtained results are compared with the latest publications of other authors [3] with quantitative results on thermophysical properties of boron carbide melt obtained on the basis of first-principle molecular dynamics calculations.

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3. Shamp A. et al,. // Phys. Rev. B. 2017. V. 95. P. 184111.