Experimental study of thermal expansion of high refractory carbides near its melting point at high temperatures

Gavrilev A.Ch.[1,@], **Senchenko V.N.**[1] **and Melnikov S.A.**[1]

[1] Joint Institute for High Temperatures of the Russian Academy of Sciences, Izhorskaya 13 Bldg 2, Moscow, 125412, Russia

[@] gavrilev.ach@phystech.edu

The experimental study of the thermal expansion of refractory titanium and molybdenum carbides, in particular the effect of stoichiometry on the thermal expansion coefficient under fast electric heating 10^7 to 10^8 K/s are of great interest nowadays. The novelty of the proposed approach is the use of precision technology of optical pyrometry, high-speed digital visualization of the thermal expansion of the materials under study, as well as the possibility of using various heating rates. The chosen approach allows us to investigate the thermal expansion coefficient of refractory carbides over a wide range of high temperatures for stoichiometries previously unstudied. Direct measurement of the sample temperature makes it possible to switch off the heating at a given temperature in real time (during the experiment). The thermal expansion coefficients of refractory carbide TiC of stoichiometric composition were experimentally determined at high temperatures (up to 3.2 kK) and buffer gas pressure up to 0.1 GPa. In pulse experiments, a melting plateau and an extended region of a two-phase zone were recorded on thermograms, which make it possible to study the melting process in similar metal–carbon systems of various compositions. An improved method for measuring thermal expansion by sample glow, which has a high response speed of up to 4 μs, was used in the experiments. The obtained data on the thermal expansion of TiC show good agreement with available literature data in the range up to 2.8 kK.