

Melting of diamond and tungsten under pulsed laser heating at pressures up to 50 GPa

Bulatov K.M.¹, Khorobrykh F.S.¹, Zinin P.V.¹ and Kutuza I.B.^{1,®}

¹ Scientific and Technological Center of Unique Instrumentation of the Russian Academy of Sciences, Butlerova 15, Moscow, 117342, None

® kutuza@mail.ru

Direct observation of diamond melting under high pressures is challenging because diamond is transparent to laser radiation, so direct heating is impossible. This study investigated the melting process of diamond induced by pulsed laser heating of a tungsten plate in a DAC [1]. At a pressure of 50 GPa, during the melting of tungsten at temperatures near 3800 K, a powerful flash was observed, within which the temperature reached 4500 K. As a result of the flash, craters several microns deep formed on the diamond anvils. The diameters of the indentations are 2-3 microns. Analysis of the indentations, conducted using scanning electron microscopy and Raman spectroscopy, showed that there was no graphite phase present. This indicates that melting of the diamond occurred. This research was performed with the financial support of the Ministry of Science and Higher Education of the Russian Federation (FFNS-2022-0008) The research was carried out using the unique scientific installation ‘Laser Heating in High Pressure Cell’ in STC UI RAS [ID: 507563, <https://unu.ntcup.ru>].

- [1] Popov M Y, Churkin V D, Kulnitskiy B A, Kirichenko A N, Bulatov K M, Bykov A A, Zinin P V and Blank V 2020 *Nanotechnology* **31**(31) 315602(1–6)