Melting temperature of graphite and nature of liquid carbon remains a subject of permanent discussions in the literature for many decades. The main reason of this inconsistency is the extremely high melting temperature of graphite making it the most refractory material. Moreover, melting of graphite is possible only at pressures higher than ca. 100 bar (this latter is stated by most of researchers). The present study deals with a further improvement of the laser-heating technique first used in [1] with the aim to reach a higher reproducibility of the results, to improve and to broaden means of optical measurements and to better control the process of cooling and freezing of liquid carbon.

Very high reproducibility of the heating thermograms is achieved, which allowed one to make more precise evaluation of the knee point at the ascending flank of the thermogram first reported and interpreted in [1]. The frozen liquid carbon and the adjacent area are studied using the SEM microscopy. The peculiarities of melting of graphite and freezing of liquid carbon are discussed. Distinctive feature of the present study is the use of high speed video observation in reflected light of formation of liquid carbon, which has been successfully performed in spite of extremely intensive thermal radiation of condensed carbon at temperatures at the vicinity of 5000 K. New data on estimation of liquid carbon density along with the peculiarities of vaporization of liquid carbon and condensation of carbon vapor in the pressure range up to 5 kbar are presented.