Deformation dynamics of the window material plates in the exploding foils experiments

Ivanov A V[@] and Rakhel A D

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

[@] avivanov_2@edu.hse.ru

The interferometric technique which is used in the experiments [1] for the measurements of thermal expansion and pressure in the sample assumes that deformation of the window material plates is one-dimensional (1D). This condition imposes severe restriction on the duration of the experiments since the deformation waves reflected from the free surfaces and the lateral surfaces of the plates appear in the field of the laser beam of the interferometer. Thus, to prolongate the measurements the size of the window material plates must be increased that increases drastically the cost of the experiments. On the other hand, the measurements performed over the times when the 3D deformation effects play an important role can also be useful if the results are properly interpreted, and the uncertainty of such measurements are reasonably estimated.

The deformation dynamics of the window material plates due to the superposition of the main longitudinal wave, formed in the plates by the expanding metallic sample, and the waves reflected from the surfaces of the plates are analyzed for the time interval $t < 2\tau$, where τ is the propagation time of the main wave (being an acoustic perturbation) from the sample to the free surface of the plate opposite to the sample. The effects of the 3D deformation of the window material plate on the interferometric measurements of the displacement of the sample surface [1] are investigated and the errors of the measurements due to these effects are estimated.

[1] Kondratyev A M and Rakhel A D 2019 *Phys. Rev. Lett.* **122** 175702