Method for simultaneous determination of mass and wave velocities in radio-transparent materials based on microwave doppler diagnostics

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The method of microwave Doppler diagnostics has found a fairly wide application in the study of shock-wave and detonation processes, which is due to the possibility of propagation of probing radio radiation in various non-metallic materials, primarily in solid explosives, and acceptable accuracy in determining the velocities of shock and detonation waves. In some cases, in the absence of ionization of shock-compressed matter, it is possible to obtain information using the micro-wave method about two kinematic parameters at once-the wave and mass velocity, which are necessary for determining the shock-wave compression of materials.

In this paper, the algorithm for determining the wave and mass velocities in radiotransparent materials was improved, which made it possible to increase the accuracy of the experimental information obtained using the method.

To test the method, a series of experiments was carried out to study the shock-wave compressibility of polymethylmethacrylate (PMMA) in the pressure range from 3.5 to 13 GPa. Using the microwave diagnostic method, data on the mass and wave velocities were obtained in each experiment, and the dielectric constant of shock-compressed PMMA was estimated.