The application of synchrotron radiation to study excitation of explosion detonation and the process of shock-induced emission of particles from a free metal surface

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The results of experiments on studying the possibility of using synchrotron radiation (SR) for recording the dynamics of the spatial distribution of matter densities during shock-wave initiation of explosives and in shock induced dust flows. At the study of shock-wave initiation of detonation, the evolution of an initiating shock wave into a detonation wave in an explosive based on HMX (octogen) was studied. As a result, x–t diagrams of the propagation of wave processes were obtained, as well as the distributions of the densities of the substance along and across the investigated charge during the passage of shock and detonation waves through it. At the study of shock-wave "dusting" in vacuum, air, and helium at various initial pressures, we used samples of tin with different roughness. The data obtained with the help of SR are compared with the measurements carried out in parallel by the method of piezoelectric sensors and PDV (photon Doppler velocimetry). It is shown that the SR method makes it possible to carry out multi-frame radiographic measurements of density distributions in shock-induced dust flows. The obtained experimental data make it possible to refine and improve the mathematical models of the corresponding phenomena.