Abstract Submitted
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Film-substrate hydrodynamic interaction initiated by femtosecond laser irradiation[1] VIKTOR KHOKHLOV, NAIL INOGAMOV, Landau Institute for Theoretical Physics, RAS, Russia, VASILY ZHAKHOVSKY, DENIS ILNITSKY, KIRILL MIGDAL, All-Russia Research Institute of Automatics, ROSATOM, Russia, VADIM SHEPELEV, Institute for Computer Aided Design, RAS, Russia —
Action of an ultrashort single laser pulse onto a thin metal film is considered. Disruption of a plane freestanding film quickly heated by laser is the simplest model of laser spallation. There is a sharp spallation (ablation) threshold F_a dividing dynamics of freestanding film to two regimes: below or above the threshold F_a. Problem of significant importance is: how this picture will change when a film is deposited onto substrate? We have solved this problem. It is found that there are two thresholds $F_s < F_a$ and three regimes of motion relative to the case of freestanding film. For $0 < F < F_s$ film oscillates remaining on substrate. Oscillations decay in time due to irradiation of sonic waves into substrate. For $F_s < F < F_a$ the film delaminates from substrate because negative pressure propagating with acoustic wave comes to a film-substrate contact and overcomes cohesion strength of a contact. In the third regime $F_a < F$ there is disruption of a film before the instant when negative pressure separates metal and dielectric substrate at a contact.

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