Fracture of solid and liquid lead by the action of a shock wave with a falling profile

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The paper presents experimental set-up and experimental results to study a fracture behavior of lead in solid and liquid phase states under the action of a shock wave with a falling triangular profile (a Taylor wave). A maximum amplitude of a shock wave (SW) at entry into a sample amounts to 17, 44 GPa. It corresponds to a solid and liquid state of lead at unloading. A gradient of a pressure decrease behind SW was 120 GPa/cm. The fracture behavior was determined by analyzing an acceleration pulse of an accelerated sample at substrates made of fluoroplastic and lithium fluoride recorded through techniques of a manganin-based sensor and a laser interferometer "Visar". When recording spall in a "solid" phase, the authors recorded a typical pulse complying with deceleration of a thin spall layer and a practically total lack of further pulses up to the moment of deceleration of great bulk of a sample. The deceleration of a "liquid" phase is characterized via a monotonically decreasing velocity profile, whose amplitude decreases with increase in a distance. Characteristic pulses, which are connected with the spall layer formation and its separation from the remainder of the sample, were not recorded. Lots of experimental data were achieved to verify calculated models. As a result of comparative experiments for the studies of spall fracture in "solid" and "liquid" phases, a considerable difference was showed in characters of recorded velocity profiles and pressure profiles.