On the effect of gaps on two-layer plate acceleration dynamics

Perevezentsev D.S.[1,@], **Krasilnikov A.V.**[1], **Olkhovsky A.V.**[1], **Degtyaryov A.A.**[1], **Sidorov K.S.**[1] and **Zinatulin R.R.**[1]

[1] Federal State Unitary Enterprise "Russian Federal Nuclear Center – All-Russia Research Institute of Technical Physics named after Academician E.I. Zababakhin", Vasilieva str 13, Snezhinsk, 456770, Russia

[@] perevezencewds@mail.ru

Any compound item has irremovable gaps between its components. The gaps come from fabrication technology, non-perfect fit in assembling, or the different thermal expansion of materials. The gap size influences the velocity of shells and the pressure in them when they are accelerated by a shock wave. The paper presents results obtained in the study on how the gap size influences the final velocity of a two-layer steel plate accelerated by a shock wave. The layers were 1 mm thick. The gap between them was varied from 0 to 0.2 mm. To avoid the early effect of the overtaking unloading, the plate was loaded by a 6-mm-thick aluminum projectile accelerated to a velocity of about 680 m/s on a light-gas ballistic plant. The free surface velocity measurements were taken with a multi-channel laser-heterodyne technique (PDV) [1-2]. In the course of the work we have studied the effect of the size of the gap between plates on their peak and final velocities, and on the pressure near the probed surface when the first shock comes. We also implemented shock-wave interference on the plate contact surface for a certain gap size.

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