Computations of wave formation phenomena in collision of metals

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The problem of wave-formation processes that occurs in high-velocity collisions of metals is considered. Waves propagate in the vicinity of the interface of two plates. Such phenomena arise in explosive welding of metals, and attempts have been made to give a quantitative explanation of these effects. To study wave formation, special experiments are implemented. In these experiments, oblique collisions of metal plates are considered: two moving plates strike a multilayer metal plate at some angles with the surfaces of the latter plate. Plate velocities are about $0.65km/s$. Periodic waves are observed on the collision contact surfaces. An explanation of these effects was proposed three decades ago in [1]. This stage of investigation is connected with the development of a new concept and is based on new theoretical, experimental and computational achievements. In this report special attention is given to computational aspects of wave-formation process. The hydrodynamic model is used for simulation. The computational model is based on the adaptive method for 2D unsteady gasdynamic equations. This method employs moving block-structured curvilinear grids with explicit computation of contact (slip) interfaces. The results of computations show that there are periodic waves on contact surfaces, and the hydrodynamic model yields a qualitative description of the wave-formation process. Thus, this model may be considered as a starting point for development of an adequate model, including elasticity equations in the vicinity of slip surfaces.

1. S.K. Godunov, A.A. Deribas, A.V. Zabrodin, N.S. Kozin. Hydrodynamic Effects in Colliding Solids. J. of Comp. Physics, Vol. 5, No 3 , June 1970, pp.517-539.