MOVING WINDOW TECHNOLOGY FOR SIMULATION OF SHOCK WAVE PROPAGATION IN DIFFERENT MEDIA

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This paper describes an approach to modeling stationary shock waves (SW) in materials using the developed method of moving observation window used in conjunction with Lagrangian numerical methods. This approach allows to iteratively adjust the reference frame to the boundary conditions, which provides control of the entrance to and exit from a fixed computational domain of particles modeling the flow of a compressible medium.

The method was first applied with the molecular dynamics [1] method, and the method developed in this work can also be applied with the smoothed particle hydrodynamics method and with mesh Lagrangian methods of similar purpose. This extends its applicability for modeling a wide range of physical processes, including the dynamics of liquids and gases under various conditions.

Modeling of stationary SW in porous materials is an important area of research in explosion and shock wave physics. Porous materials have complex structures that can significantly influence the behavior of SW. The method allows to accurately model these effects and obtain data on the structure and behavior of SW. The paper shows the advantage of the method over the previously developed method [2] in terms of the speed of establishment of stationary flow in the observation window. This suggests that the moving window technology is more effective for modeling stationary SWs.

The calculated shock adiabatic of porous copper and the studied structure of the plastic compacting wave and elastic precursor in porous copper at shock amplitude near the yield strength of solid copper demonstrate the capabilities of the method for modeling complex physical processes. The possibilities of modeling stationary shock waves within the framework of the molecular dynamics method are also demonstrated.

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1. Zhakhovsky V.V., Budzevich M.M., Inogamov N.A., Oleynik I.I., White C.T. // Phys. Rev. Lett. — 2011. — V. 107, No. 13. — P. 135502.

2. Murzov S.A., Parshikov A.N., Dâ€™yachkov S.A., Egorova M.S., Medin S.A., Zhakhovskii V.V. // High Temp. — 2021. — V. 59, No. 2. — P. 230–239.