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Numerical Simulation of Superfast Shock-Induced Chemical Reactions in Porous Mixtures SERGEY ZELEPUGIN, Tomsk Science Center, VITALY NIKULICHEV, Kyrgyz-Russian Slavonic University, OKSANA IVANOVA, Tomsk State University — A phenomenological zeroth-order kinetic model for computations of shock-induced solid-state chemical reactions in porous mixtures is proposed. In the model a porous mixture is considered as a continuous medium whose thermomechanical properties are determined at each time step depending on mass fractions of the components. The kinetic relationships are characterized by a constant rate of chemical transformations under shock wave loading. The heat release due to chemical transformations is introduced in the energy equation. The effect of the dispersity of the mixture components on the reaction rate is taken into account by varying the constants that enter the kinetic model. The results of the numerical computations for porous Ti-C, Ti-Si, and Al-S mixtures reflect the fact that the process can be divided into several stages (dynamic compaction, shock-wave propagation, reaction of synthesis). It is shown that an increase in the chemical-reaction rate gives rise to flow regimes in which the unloading wave almost stops.

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