Shock wave loading of pressed aluminum V-ALEX nanopowder up to pressures of 30 GPa

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The impact response of nanostructured systems are of great interest due to their advantageous characteristics provided by the ultrasmall scale of constituent elements. In this work the shock Hugoniot and shock wave profiles of pressed aluminum V-ALEX nanopowder were obtained in the ranges of mass velocities up to 2.5 km/s and pressures up to 30 GPa. Samples were made of the commercially available aluminum V-ALEX nanopowder. The shock Hugoniot of the studied material deviates from the shock Hugoniots of microsized aluminum with the same initial porosity [1]. This is probably due to the presence of CH2=CF2 and CF3-CF=CF3 polymers in the composition of the initial V-ALEX powder and their behavior at high pressures. Experimental points were obtained at the contact boundaries with LiF and water windows in the pressure-mass velocity coordinates. Upon unloading from states with pressures less than 15 GPa, the isentropes coincide well with the "mirror" isentropes of solid D16 aluminum. However, upon expansion from states with pressures of 30-25 GPa, the V-AlEX isentropes deviate significantly from the "mirror" isentropes. This may indicate that some processes are occurring in the material compressed by the shock wave.
This work was funded by the Russian Science Foundation, Grant No. 24-19-00746.

[1] McQueen R G, Marsh S P, Taylor J W, Fritz J N and Carter W J 1970 Chapter vii – the equation of state of solids from shock wave studies *High-Velocity Impact Phenomena* ed Kinslow R (New York) pp 293–417