Shockwave response of Kevlar/Epoxy composite up to 30 GPa

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Composite materials are often used as structural components in different fields of science and technology. In this work, an experimental study of the shock compressibility and spall strength of a Kevlar/epoxy composite was performed. To generate high dynamic pressures in the material, we used the impact of flat-plate aluminum projectiles accelerated by explosive planar shock wave generators to velocities ranging from 0.65 to 5.05 km/s. Particle velocity profiles were recorded on the composite surface–water window interface with a multichannel VISAR laser interferometer. Hugoniot parameters of Kevlar/epoxy composite were obtained with a kink in the vicinity of 17 GPa which can be associated with a phase transition. It is shown that the shock compressibility and spall strength of composite almost do not depend on the fiber orientation. It was found that the values of spall strength of the material were significantly lower than that of epoxy resin. The influence of the anisotropy of the composite is manifested in the formation of a two-wave configuration at the shock wave propagation along the fibers.

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