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Failure model for boron carbide ceramics improved with using explosive experiments data SERGEY DYACHKOV, ANATOLY PARSHIKOV, VASILY ZHAKHOVSKY, SERGEY KURATOV, Dukhov Research Institute of Automatics — Boron carbide is known for its outstanding mechanical properties. Being lightweight, it has the considerable failure strength of about 15-19 GPa under impact loading. However, heavy loads result in material failure which is observed both in wave profiles in plate impact tests and shock hugoniot data. Johnson and Holmquist incorporated the observations to the well-known failure model for fluid dynamics simulations. However, being validated on one dimensional tests the model applications to complex three dimensional systems containing boron carbide parts are limited. Here we suggest an improved explicit failure model and apply it for modeling of explosively compressed boron carbide spherical shell. Using x-ray images of the shell dynamics captured after the main load of tens of GPa, it is found that the further evolution of boron carbide shell is guided by the failure strength curve at low pressures of several GPa. The adjustement of failure model made at low pressures is shown to have almost no effect on usual plate impact tests, but it is essential for the predictive modeling of boron carbide samples during unloading.

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