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Fracture Mechanisms of Zirconium Diboride Ultra-High Temperature Ceramics under Pulse Loading[1] VLADIMIR V. SKRIPNYAK, Tomsk State University, ANATOLII M. BRAGOV, N. I. Lobachevski State University of Nizhny Novgorod, VLADIMIR A. SKRIPNYAK, Tomsk State University, ANDREI K. LOMUNOV, N. I. Lobachevski State University of Nizhny Novgorod, EVGENIYA G. SKRIPNYAK, IRINA K. VAGANOVA, Tomsk State University — Mechanisms of failure in ultra-high temperature ceramics (UHTC) based on zirconium diboride under pulse loading were studied experimentally by the method of SHPB and theoretically using the multiscale simulation method. The obtained experimental and numerical data are evidence of the quasi-brittle fracture character of nanostructured zirconium diboride ceramics under compression and tension at high strain rates and the room temperatures. Damage of nanostructured porous zirconium diboride -based UHTC can be formed under stress pulse amplitude below the Hugoniot elastic limit. Fracture of nanostructured ultra-high temperature ceramics under pulse and shock-wave loadings is provided by fast processes of intercrystalline brittle fracture and relatively slow processes of quasi-brittle failure via growth and coalescence of microcracks. A decrease of the shear strength can be caused by nano-voids clusters in vicinity of triple junctions between ceramic matrix grains and ultrafine-grained ceramics.

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Vladimir Skripnyak
Tomsk State University

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