Abstract Submitted
for the SHOCK17 Meeting of
The American Physical Society

Fourth-power law structure of the shock wave fronts in metals and ceramics[1] YURIY BAYANDIN, OLEG NAIMARK, NATALIA SAVELEVA, Institute of continuous media mechanics, Ural Branch of RAS, Perm, Russia — The plate impact experiments were performed for solids during last fifty years. It was established that the dependence between the strain rate and the shock wave amplitude for metals and ceramics expressed by a fourth-power law [1-3]. Present study is focused on the theoretical investigation and numerical simulation of plane shock wave propagation in metals and ceramics. Statistically based constitutive model of solid with defects (microcracks and microshears) was developed to provide the relation between damage induced mechanisms of structural relaxation, thermally activated plastic flow and material reactions for extreme loading conditions. Original approach based on the wide range constitutive equations was proposed for the numerical simulation of multiscale damage-failure transition mechanisms and plane shock wave propagation in solids with defects in the range of strain rate $10^3 - 10^8 s^{-1}$. It was shown that mechanisms of plastic relaxation and damage-failure transitions are linked to the multiscale kinetics of defects leading to the self-similar nature of shock wave fronts in metals and ceramics. [1] Barker L.M. Behavior of dense media under high dynamic pressures. N.Y. 1968. [2] Swegle J.W & Grady D.E. J.Appl.Phys. 1985. 58. [3] Grady D.E. J.Appl. Phys. 2010. 107.

[1]The work was supported by the Russian Science Foundation (project no. 14-19-01173).

Iurii Baiandin
Institute of continuous media mechanics, Ural Branch of RAS

Date submitted: 10 Apr 2017 Electronic form version 1.4