

Abstract Submitted
for the SHOCK19 Meeting of
The American Physical Society

Modeling of ultrashort pulsed laser induced stress field evolution.

JIAMIN LIU, HAO JIANG, SHIYUAN LIU, Huazhong University of Science and Technology — The energy deposition process and the mechanical response of materials under ultrashort pulsed laser irradiation are usually analyzed using Two Temperature Model combined with elasticity. However, the neglect of the dynamic optical property changes, the electron kinetic pressure and the dimensional effects may lead to the underestimation of the magnitude and the propagation length of laser-induced stress wave. Herein, we have propose a theoretical model to describe the interaction mechanism between the ultrashort pulsed laser and material, in which the effects of temperature-dependent optical constants on the energy deposition process and the contribution of electron hot-pressure to stress wave have been considered. The proposed model implemented based on the 3D implicit finite difference algorithm is then carried out to achieve the profile of stress field. The simulation results show that the maximum stress and the distribution depth achieved by the proposed method are both larger than the results of conventional method, with the increased percentage of 10% and 24%, respectively.

Hao Jiang
Huazhong University of Science and Technology

Date submitted: 22 Mar 2019

Electronic form version 1.4