

# THERMAL EFFECTS OF HIGH ENERGY AND ULTRAFAST LASERS

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## ABSTRACT

The main objective of this research is to study the effects of high energy and ultrashort laser on materials. Heat and mass transfer are kinetic processes that may occur and be studied separately or jointly. There are complex problems where heat and mass transfer processes are combined with chemical reactions, as in combustion. The resulting behavior of heat transport in microscale will be very different from macroscale heat transfer based on the averages taken over hundreds of thousands of grains (in space) and collision (in time). For extremely heated surfaces by high energy laser pulse, it is very difficult to measure temperature of flux at the heated surface because of the unendurable capacity of the conventional sensors. Laser is the tool of choice when drill holes ranging in diameter from several millimeters to less than one micro-meter. Instead of having advanced melting and resolidification modeling process recently, the inherent uncertainties of the input parameters can directly cause unstable characteristics of the output results which mean the parametric uncertainties may influence the characteristics of the phase change processes.