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Aluminum dust ignition behind reflected shock wave: two-dimensional simulations

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Abstract

In this paper results of parallel computer simulations on aluminum dust ignition behind a reflected shock wave are presented. Computations show the time-evolution of a complicated flow field created due to a shock wave collision with a pile of dust, shock reflection from a wall, and its interaction with vortices. Particles, blown away by the incident shock, are heated mainly behind the reflected shock wave. The estimated ignition delay time is of the order of 80-100μs and is a strong function of the incident shock wave strength. The simulations show that it may be very difficult to ignite aluminum particles when the incident shock wave Mach number is smaller than about $M_s \approx 3$, while for stronger shocks the estimated ignition delay time quickly decreases.

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