Shock Wave Reflections in Dust-Gas Suspensions

by

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Abstract

The reflection of planar shock waves from straight wedges in dust-gas suspensions has been investigated numerically. The GRP shock capturing scheme and the MacCormac scheme are applied to solve the governing equations of the gaseous and solid phases, respectively. These two schemes have a second order accuracy both in time and space. It is shown that the presence of the dust significantly affects the shock-wave-reflection-induced flow field. Owing to the dust presence the incident shock wave attenuates and hence unlike the shock wave reflection phenomenon in a pure gas, the resulted flow field in the present case is not pseudo steady. The presence of the dust results in lower gas velocities and gas temperatures and higher gas densities and gas pressures than in the cases of dust-free shock wave reflections with identical initial conditions. It is also shown that the smaller is the diameter of the dust particle the larger are the above mentioned differences. In addition, the smaller is the diameter of the dust particle the narrower is the width of the dust cloud behind the incident shock wave. Larger dust velocities, dust temperatures and dust spatial densities are obtained inside this dust cloud for smaller dust particles. The obtained results provide a clear picture of whether and how the presence of dust particles affects the shock-wave-reflection-induced flow field.