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Parameters of Detonation in Suspended Aluminum Dust

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Abstract: Detonation in suspended aluminum dust in tubes was analyzed with two-phase flow model. Development and propagation of aluminum dust detonation with diameter of particle $3.4 \mu\text{m}$ in detonation tube with inside diameter 15.2 cm was numerically simulated. The differences of velocity and temperature between gas and particles were considered. The dissipation by the convective heat transfer and viscosity through tube wall was taken into account. Velocity of detonation and ignition distance of particles was obtained in suspended aluminum dust with difference concentration of aluminum dust. Also the lower detonation limit was obtained which was equivalence ratio 0.25. Furthermore, detonation velocity in suspended aluminum dust with infinity tube diameter was calculated and lower detonation limit was determined which was 0.16. The detonation parameters of suspended aluminum dust in different tube diameters were obtained with equivalence 1 and critical diameter of tubes was determined.

Key words: explosion mechanics; detonation; suspended aluminum dust; parameters of detonation; detonation limit

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