Ignition, combustion and detonation onset in non-uniform dispersed fuel-air mixtures

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The paper presents the review of results of theoretical, numerical and experimental investigations of combustion and detonation initiation in heterogeneous polydispersed mixtures. The problems of fuel droplets atomization, evaporation and combustion and the non-equilibrium effects in droplets atomization and phase transitions were taken into account. The effects of droplets size non-uniformity and spatial distribution non-uniformity on mixture ignition and flame acceleration were investigated for strong and mild initiation of detonation: by a shock wave and spark ignition followed by deflagration to detonation transition (DDT). Peculiarities of jet injection and ignition in reaction chamber are studied.

In ignition of turbulized organic particles mixture with air turbulence brings to an increase of flame propagation velocity, but inhibits ignition due to rapid dispersion of ignition energy from the ignition point. (Fig. 1)

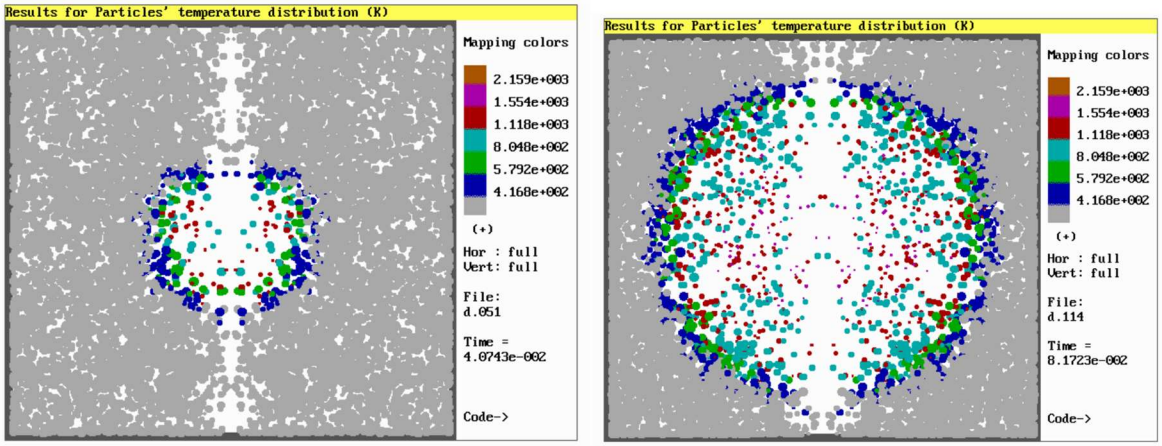

Fig.1.

Investigating droplet cloud strong ignition by a shock wave showed that droplets atomization and heating takes place behind the shock wave. Gradual heating and evaporation of droplets gives birth to ignition of mixture. Fig. 2 shows one stage of shock wave entering the dispersed mixture: *droplets size and temperature.*

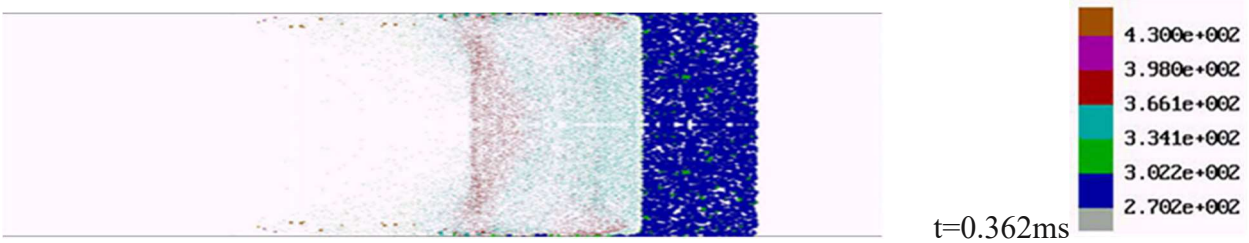

Fig. 2

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