DETONABILITY LIMITS OF LIQUID FUEL SPRAYS

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A new mathematical model of steady-state spray detonation structure has been developed. The model is based on the macroscale–microscale coupling algorithm taking into account liquid drop vaporization, ignition, and diffusion-controlled combustion, as well as the screening effects of neighboring drops and multistep chemistry. As an example of model implementation, the detonation structure and detonability limits of n-hexane drop suspensions in air were studied computationally. The conditions of detonation existence and detonability limits have been obtained in terms of drop size, initial fuel–air ratio, fuel prevaporization degree, and initial pressure and temperature.