



Influence of two breakup models on the droplet behavior in a cellular gaseous detonation

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Simulations of two-phase detonation, such as those presented in [1], often rely on a breakup model based on simplified assumption, such as a linear decrease in the droplet diameter [2]. However, large droplets can produce small droplets through mechanisms such as shear induced entrainment (SIE) and Rayleigh-Taylor Piercing [3,4], rendering this simplified assumption inaccurate. Additionally, a distribution of droplet diameter after the breakup process is expected [5]. The size of these droplets is closely linked to the time scales associated with heating, evaporation, breakup, and velocity relaxation. Consequently, any changes in the prediction of the droplet diameter after the breakup can significantly influence the dynamics of two-phase detonation.

The study evaluates the influence of breakup model on the behavior of a droplet in a cellular gaseous detonation. To efficiently compare the droplet behavior under two distinct breakup models, we employed a one-way coupling approach. This method was chosen to specifically isolate the effect of the flow fields on droplet dynamics.

This preliminary work will compare the results obtained from two different breakup models. The first model operates under simplified assumption that the droplet diameter changes linearly during the breakup process. In contrast, the second model incorporates two distinct peaks in the diameter distribution.

First results will be communicated at the conference.

References

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