## Flow-field Analysis and Pressure Gain Estimation of Rotating Detonation Engine with Kerosene/air Mixture

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## Abstract

The flow-field structure and pressure gain performance of the two-dimensional modeled rotating detonation combustor with discrete distribution of reactants have been studied fueled by kerosene/air mixture. An unsteady reacting flow solver named *rhoHLLCFoam* is developed based on the open source software OpenFOAM, version 7.0. After checking the reliability of the solver, cases with various inletarea ratios are conducted. The results show that with  $\psi < 1.0$ , the reactants in triangle gas layers present a discretely striped distribution. At the position far away from the head-end wall of combustor, the fresh reactants and combustion products are mixing with each other which causes the deflagration zones in triangle gas layers. The area of deflagration zones increases with the decrease of  $\psi$ . When  $\psi$  equals to 0.80, the reactants remaining after deflagration process in deflagration zones cannot support the propagation of detonation leading to the partially decouple of detonation front. Moreover, the pressure gain ratio  $\eta$  of combustion chamber is estimated. The result suggests that  $\eta$  decreases with the reduction of  $\psi$ . In order to realize pressure gain in kerosene/air RDE, a choked aerospike nozzle is necessary.

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