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Effect of initial conditions on a high Schmidt-number Rayleigh-Taylor mixing layer L.A.RAGHU MUTNURI, ARINDAM BANERJEE, Missouri S&T — An experimental investigation of the effect of initial conditions in spatiotemporal evolution of a high Schmidt number, low Atwood number (0.00075), reactive, turbulent Rayleigh-Taylor (RT) mixing layer will be presented. A horizontal solid barrier separating the participating fluids, contained in a static tank, is withdrawn to produce the RT unstable configuration and is similar in configuration to experiments of Dalziel (JFM-1999). The physical shape of the barrier coupled with the wake left on its withdrawal; define the spatial structure of initial perturbations. Passive control of initial conditions is attained by varying the shape of the barrier for a defined withdrawal rate. The design of the barrier is guided by integrated large-eddy simulations of the Euler equations in three dimensions with numerical dissipation, to the desired effect. Backlit imaging is used to study the temporal evolution of the RT mixing layer. Diffusion limited neutralization reaction in the presence of an indicator is used as a marker to quantify the extent of molecular mixing of the two fluids. The evolution of bubble growth coefficient, molecular mixing parameters and probability density functions are analyzed to draw comparison with existing numerical and experimental data.

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