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Effects of Energetic and Inert Nano Particles on Burning Liquid Ethanol Droplets[1] MIGUEL PLASCENCIA, HYUNG SUB SIM, ANDRES VARGAS, OWEN SMITH, ANN KARAGOZIAN, UCLA — This study explores the effects of nano particulate additives on ethanol fuel droplet combustion in a quiescent environment. Two different types of droplet combustion experiments were performed: one involving the classic single droplet suspended from a quartz fiber and the other involving a burning droplet that has continual fuel delivery via a quartz capillary. Two alternative nano particles were explored here to demonstrate the effect of energetic additives: reactive nano aluminum (nAl) and inert nano silicon dioxide (nSiO2), each with average diameter 80 nm. Simultaneous high speed visible and OH* chemiluminescence images were taken to determine burning rate constants (K) and to study flame and droplet characteristics with varying particulate concentrations. Particle/vapor ejections were seen in continuously fed droplet experiments, while rod-suspended burning droplets showed limited particle ejection. The nSiO2-laden, rod-suspended droplets formed a porous, shell-like structure resembling the shape of a droplet at higher nSiO2 concentrations, in contrast to smaller residue structures for nAl-laden droplets. Changes in K depended on concentrations of nAl and nSiO2 as well as the method of droplet formation, and TEM images of particle residue revealed additional insights.

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