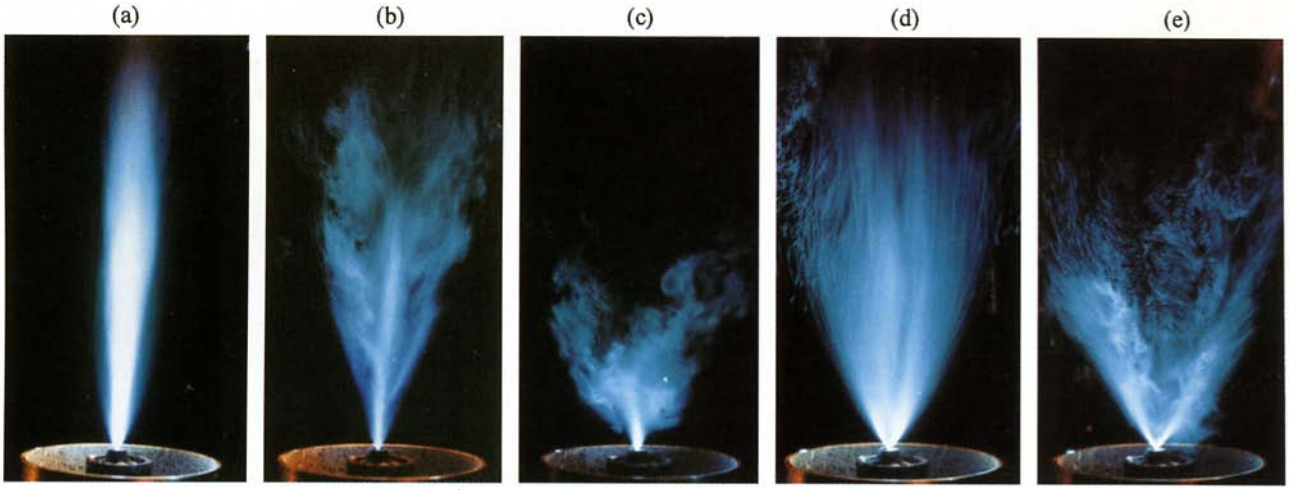

HEAT TRANSFER EFFECTS ON DROPLET VAPORIZATION BY AIR PREHEATING

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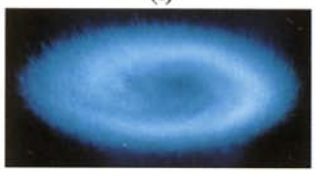
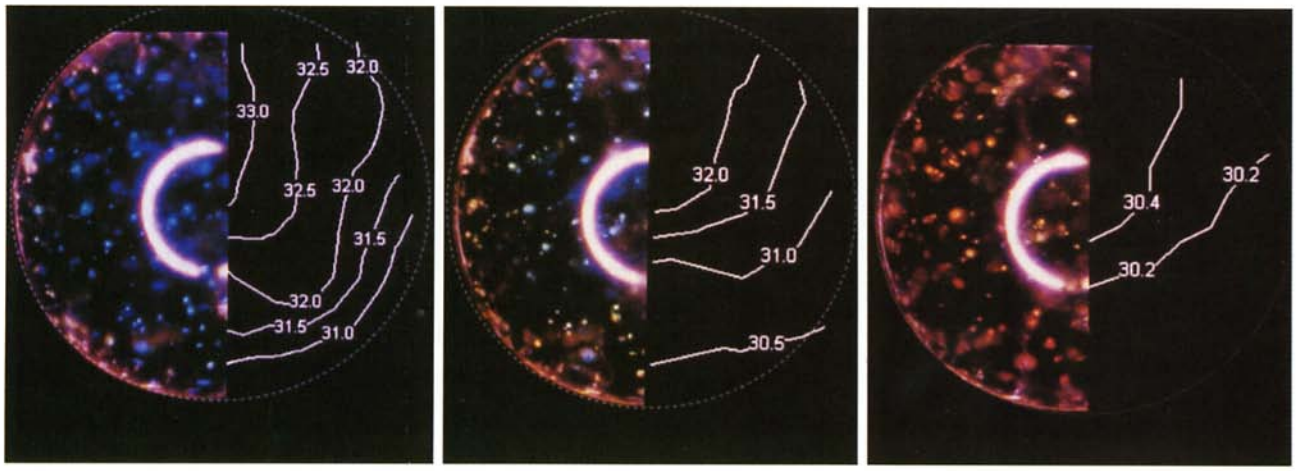
These laser sheet beam photos show the effect of combustion air swirl at a vertical cross section (through the centerline) of vaporizing fuel sprays with surrounding coflowing air heated to about 430 K. The fuel spray was produced with a commercially available pressure-jet nozzle. Photos a, b, and c are for methanol while Photos d and e are for kerosene fuel under identical flow conditions. The structure of the spray changes significantly as the Swirl number is changed from 0 (Photos a and d) to 0.24 (Photo b) and to 0.46 (Photos c and e). Photo f shows donut-shaped horizontal spray structure for kerosene at a Swirl no. of 0.46. Increased droplet vaporization for the methanol spray yields a significantly different structure than for kerosene. The spray becomes significantly narrower for methanol as a result of enhanced droplet vaporization by the surrounding heated air. The development of this laser sheet beam technique is described in the paper by Presser et al. (1990).





time = 0.000 s time = 0.133 s time = 0.267 s

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Convective Cooling of a Suspended Water Droplet

The sequence of images, taken using a long-distance microscope and a color video camera framing at 30 Hz, shows the transient temperature history of a 960 μm water droplet as it cools in air. The small patches of color in the droplet are 10 μm beads of microencapsulated thermochromic liquid crystals (TLC). The colors of the beads change with temperature, giving a visible indication of the temperature field within the droplet. The contours of constant temperature, given in degrees C, on the right hand side of each image were determined by calibrating the hue of the microencapsulated TLC against temperature. The sequence of six images reveals the transient temperature field, in a slice through the center of the droplet.