Center for Environmental & Applied Fluid Mechanics

"Fire Hazards of Small Hydrogen Leaks"

Presented by

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Hydrogen is attractive as an energy carrier for highway vehicles, but it presents several unusual fire hazards. In this work quenching and blowoff limits and materials degradation of hydrogen diffusion flames were examined. Burners with diameters between 8 microns - 6 mm and leaky compression fittings were considered. In terms of mass flow rate, hydrogen had a lower quenching limit and a higher blowoff limit than either methane or propane. Hydrogen flames at their quenching limits were the weakest flames recorded to date, with mass flow rates and heat release rates as low as 3.9 microgram/s and 0.46 W. The quenching limits were generally independent of hole diameter and burner orientation, and decreased with increased surface curvature. The quenching limit for a hydrogen flame at a 6 mm leaky compression fitting was found to be independent of supply pressure (up to 131 bar) and about an order of magnitude lower than the corresponding limits for methane and propane. Impinging hydrogen flames were found to cause accelerated corrosion to aluminum and other metals.

Bio: Peter B. Sunderland is Assistant Professor of Fire Protection Engineering at the University of Maryland. His research interests are in combustion and fire protection, including hydrogen flames, soot formation, laminar diffusion flames, vehicle fires, microgravity combustion, and diagnostics development. His degrees are from Cornell University (B.S.), the University of Massachusetts (M.S.), and the University of Michigan (Ph.D.).

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