Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Spark Ignition: Effects of Fluid Dynamics and Electrode Geometry SALLY BANE, JACK ZIEGLER, JOSEPH SHEPHERD, California Institute of Technology — The concept of minimum ignition energy (MIE) has traditionally formed the basis for studying ignition hazards of fuels, and standard test methods for determining the MIE use a capacitive spark discharge as the ignition source. Developing the numerical tools necessary to quantitatively predict ignition is a challenging research problem and remains primarily an experimental issue. In this work a two-dimensional model of spark discharge in air and spark ignition was developed using the non-reactive and reactive Navier-Stokes equations. The simulations were performed with three different electrode geometries to investigate the effect of the geometry on the fluid mechanics of the evolving spark kernel and on flame formation. The computational results were compared with high-speed schlieren visualization of spark and ignition kernels. It was found that the electrode geometry had a significant effect on the fluid motion following spark discharge and hence influences the ignition process and the required spark energy.

Sally Bane
California Institute of Technology

Date submitted: 05 Aug 2010 Electronic form version 1.4