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Planar Laser Induced Fluorescence of Shock Initiated Combustion of a Spherical Density Inhomogeneity NICHOLAS HAEHN, CHRIS WEBER, JASON OAKLEY, MARK ANDERSON, DAVE ROTHAMER, RICCARDO BONAZZA, University of Wisconsin - Madison — A spherical density inhomogeneity with a stoichiometric mixture of H_2, O_2, and a diluent such as Xe is ignited with a planar shock wave. When a heavy bubble, such as Xe, is shock accelerated in a lighter ambient gas, such as Ar, the shock wave at the exterior periphery of the bubble travels faster than the interior transmitted wave, resulting in shock-focusing at the downstream pole of the bubble. The shock wave convergence results in a temperature much higher than the one behind the transmitted shock and auto ignition may occur at this location. For non-point source ignition experiments, the temperature is raised by a second shock acceleration from the planar shock that reflects from the shock tube's end-wall. These experiments shed light on the combustion characteristics under both turbulent and non-turbulent conditions. In addition, results are used for validating hydrodynamic codes with chemical reactions. The experiments are performed at the Wisconsin Shock Tube Laboratory in a 6 m vertical shock tube with a 25.4×25.4 cm^2 square cross-section. Diagnostics are performed using planar laser induced fluorescence of the OH^- molecule present during the combustion process. A Nd:Yag pumped dye laser at a wavelength of 283 nm excites the (1,0) band of the OH^- molecule.

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