Multi-Phase Combustion Mechanisms and Diagnostics

Research focuses on the experimental investigation of multi-phase combustion phenomena, from the fundamentals of chemistry to the physics of fluid flows. There are three primary research thrusts of interest: **(1) Power & Energy** (gas-phase and spray combustion in gas-turbine and diesel engines, solid-fuel combustion in rockets/ramjets); **(2) Fire Suppression** (liquid pool/spray fires, gas/aerosol/foam suppression agents); and **(3) Pollution Remediation** (in-situ burning of crude oil spills, wellhead blowout combustion). Several laser-based and optical diagnostic techniques are employed to identify and monitor relevant species concentrations, temperatures, and flow parameters, including: coherent anti-Stokes Raman scattering (CARS) spectroscopy, spontaneous Raman scattering, phase Doppler anemometry (PDA), particle image velocimetry (PIV), multi-wavelength pyrometry, laser Doppler velocimetry (LDV), laser-induced fluorescence (LIF), tunable diode laser absorption spectroscopy (TDLAS), and emission spectroscopy. Labs are equipped with high-speed visible and infrared video cameras, FTIR spectrometers, Czerny-Turner spectrographs, holographic spectrographs, intensified CCD (iCCD) cameras, electron-multiplied CCD (EM-CCD) cameras, and photomultiplier tube (PMT) detectors. Full information about ongoing research in our section (Code 6185, Combustion & Reacting Transport) can be found at the following web address: https://www.nrl.navy.mil/chemistry/research/6180/6185.