INVESTIGATION OF A SPARK IGNITION INTERNAL COMBUSTION ENGINE VIA IR SPECTROSCOPY

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Previous work has shown that the automotive fuel components of isopropanoland ethanol can be excited by a 10.2 um and 9.3 um CO_2 lasers, respectively. Through the use of a monochromator and an indium antimonide detector, the decay time of the excited molecules was measured and found to be significantly long enough to allow for the possibility of experimentation in an internal combustion (IC) engine. In order to pursue In Situ measurements in an internal combustion engine, a MegaTech Mark III transparent engine was modified with a sapphire combustion chamber. This modification will allow the transmission of infrared radiation for time-resolved spectroscopic measurements by an infrared spectrometer. By using a Telops FIRST-MWE imaging Fourier transform spectrometer, temporally and spatially resolved infrared spectral data can be acquired and compared for combustion in the engine both with and without laser excitation. Measurements performed with system provide insight into the energy transfer vectors that precede combustion as well as provide an in situ measurement of the progress of combustion.