DEVELOPMENT OF THE LASER-INDUCED INCANDESCENCE METHOD FOR THE RELIABLE CHARACTERIZATION OF DIESEL PARTICULATE EMISSIONS

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Laser-induced incandescence (LII), a diagnostic technique for measuring spatially and temporally resolved soot particulate concentration and primary particle size in a broad range of applications, will be described. The LII method has orders of magnitude more sensitivity than the standard gravimetric techniques, offers the promise of real-time in-situ measurements, and incorporates the desirable size and morphology information. Quantitative LII is known to provide a sensitive, precise, and repeatable measure of the carbonaceous particulate concentration over a wide measurement range. LII and gravimetric measurements in the exhaust of a diesel engine have been demonstrated to correlate well over a wide range of operating conditions. The LII technique has the potential of acquiring real-time particulate matter measurements over all engine transient operation conditions. The wide dynamic range and lower detection limit of LII make it a preferred choice as a standard instrument for particulate matter measurements. The current efforts are focused on measuring soot particulate concentration and/or size from diesel engines, direct injection spark ignition engines, gas turbines, carbon black furnaces, and research flames. Examples of data acquisition in diesel exhaust and comparisons made to gravimetric methods will be presented and discussed. The importance of the LII method resides in the fact that current diesel emissions standards are lower than the practical limit for gravimetric methods but are well within the capabilities of the LII diagnostic.