

PARTICULATE DIAGNOSTICS IN FLAME REACTORS AND ENGINE COMBUSTION



Figure 1: Experimental setup

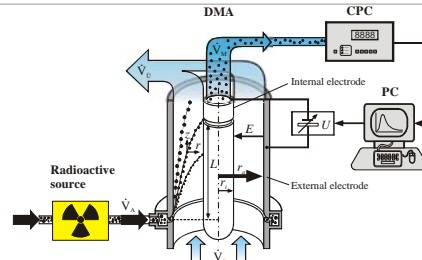


Figure 2a: DMPS system

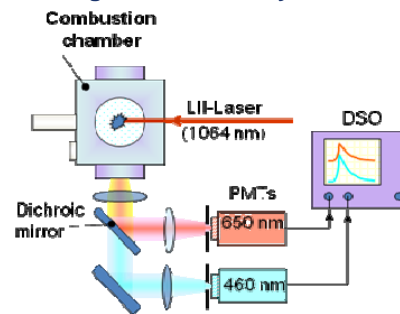


Figure 3b: TiRe-LII system

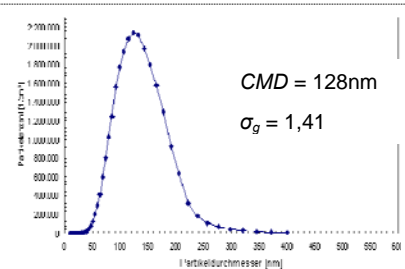


Figure 3a: DPMS measurement result

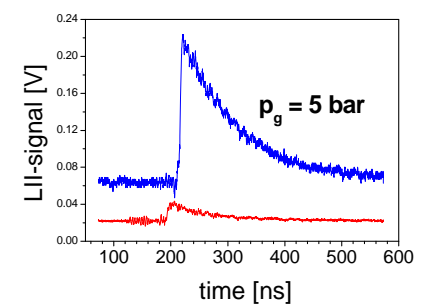


Figure 3a: TiRe LII signal curves

In many technical combustion systems, such as waste combustion or internal combustion engines, among the reduction of gaseous pollutants the reduction of particle emissions plays an important role. The particle size is a significant physical property in terms of environmental impact and health.

In our work we use purely optical as well as probe sampling techniques for the determination of concentration and size of particles formed in steady flames at sub-atmospheric and high pressure. For ex-situ analysis, particulates in the exhaust gas flow are either sampled for size and shape by transmission electron microscopy (TEM), or diluted with nitrogen and sampled by Differential-Mobility Particle-Sizing system (DMPS) for size and volume fraction.

Among the optical techniques is Time-Resolved Laser-Induced Incandescence (TiRe-LII). This laser-optical in-situ technique is based on the detection of particles heated up by a short laser pulse. Size information is gained from the detection of the luminescence intensity of the glowing particles as a function of time. Particle sizing by TiRe-LII can be applied to many combustion processes, e.g. in-cylinder processes in Diesel engines, sooting laminar flames or flame reactors for nanoparticle synthesis.

Within this project, particle-size measurements in selected flame experiments will be performed using mostly optical techniques.

This work includes the following subtasks:

- Getting familiar with DMPS and TiRe-LII measurement techniques
- Particle-size measurements in engine exhaust gases and interpretation of the results
- Short documentation and presentation of the thesis

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