ANALYSIS OF REACTION MECHANISMS IN FLAMES USING COMBINED CRD- AND LIF-SPECTROSCOPY

ANDREAS BROCKHINKE, PATRICK NAU, MARKUS KÖHLER and KATHARINA KOHSE-HÖINGHAUS, *Physikalische Chemie I, Universität Bielefeld, Universitätsstraße 25, D-33615 Bielefeld, Germany*.

Laser-based non-intrusive diagnostic techniques are firmly established as the most versatile tools to study high-temperature gas-phase reactions in general and combustion processes in particular. While fossil fuels remain the most important primary energy carriers, alternative fuels gain in importance. Usually, these fuels contain significant amounts of oxygen, nitrogen and sulphur, leading to different reaction pathways than in the established combustion of hydrocarbons. In order to minimize the formation of pollutants and hazardous compounds (soot, CO, NO_x) and increase efficiency, a deeper understanding of these reaction processes is essential.

Optical measurements, in particular Cavity Ring-Down Spectroscopy (CRDS) and Laser Induced Fluorescence spectroscopy (LIF), have proven to be well suited for quantitative radical measurements in flames (e.g. OH, $^1CH_2$, C_2, HCO). Both techniques provide high sensitivity and selectivity. Our revised experimental setup is designed for quasi-simultaneous measurements, combining the positive features of both complementary techniques. In addition, invasive methods like mass-spectrometry are performed in order to gain a complete understanding of the flame species.

In this contribution, we will focus on the quantitative determination of important minor species such as CN, NH_2, CH and formaldehyde in low-pressure flat flames. In addition to investigations of flames with hydrocarbon fuels, we present the first optical measurements in morpholine- and ethylamine-flames. Aim of these measurements is to study the conversion of fuel nitrogen to NO_x. Experimental results will be compared with numerical CHEMKIN-II simulations.