21 世紀 COE 特別講演会　報告書

集会名：(Dr.) Alexander Schocker 特別講演会
日時：　平成 17 年 4 月 26 日() 15：00～17：00
講演会場：　A2－307 号室（桂キャンパス講義室）
主な参加者：教員、本学大学院生
総参加者概数：教員 3 名、大学院生 12 名、学部学生 5 名

講演者：(Dr.) Alexander Schocker,（Bielefeld University, Department of Chemistry）

講演題目：
Detection of small radicals in high temperature combustion by cavity ring-down spectroscopy
（キャビティーリングダウン法による燃焼中のラジカル検出）

講演内容：

The detailed understanding of chemical processes and reaction mechanisms requires the development of sensitive detection methods and sensors. Especially reactive intermediates and trace species may control such reactions to a large degree, and thus the detection of such species can lead to a better understanding of complex chemical processes. Spectroscopic techniques for the detection of these small, low-concentrated species are preferable due to their non-invasivity and non-destructive nature.

This talk presents the application of the cavity ring-down spectroscopy (CRDS) for the investigation of high-temperature processes. CRDS is a modern, promising absorption technique for the detection of gaseous species down to the ppt-level It is a multi-pass absorption technique whereby the sample is placed in a high-finesse cavity and the intensity decay of the laser beam is detected behind the output mirror as the beam traverses the cavity. The long residence time of the laser pulse in the optical cavity leads to an extremely long effective path length: mirror reflectivities up to 99.999% yield absorption path lengths in the kilometer domain. Moreover, CRD measurements are made in the time domain, isolating the measurement from laser intensity noise. This combination gives the potential of extremely sensitive absorption measurements

Qualitative and quantitative measurements of reactive intermediate in high-temperature processes are presented in this talk as well as fundamental aspects like influence of the laser bandwidth on the accuracy of the concentrations measurements. Conditions and suggestions for reliable quantitative measurements are given.
Recent measurements in low-pressure propene-oxygen (C_3H_6) flames close to the soot formation threshold are presented. C_3 fuels are of particular interest, since they might facilitate the formation of benzene – a soot precursor – in one single step. An analysis of these flames in comparison to flames with other fuels might therefore yield new insights into pathways for the formation of aromatic hydrocarbons and soot.
The spatial distribution of temperature and concentrations of important reactive radicals like OH, HCO, $^1CH_2$ are presented in these fuel-rich flames under low-pressure conditions. The results are compared with theoretical calculations using the CHEMKIN-package and a very recent reaction mechanism for higher hydrocarbon fuels.

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