Investigation of NH_3–H_2 mixtures in a plug-flow reactor

L. Ruwe, Physikalisch-Technische Bundesanstalt, Braunschweig/Germany

S. Schmitt, Bielefeld University, Bielefeld/Germany

D. Zhu, Physikalisch-Technische Bundesanstalt, Braunschweig/Germany

B. Shu, Physikalisch-Technische Bundesanstalt, Braunschweig/Germany

K. Kohse-Höinghaus, Bielefeld University, Bielefeld/Germany

A. Lucassen, Physikalisch-Technische Bundesanstalt, Braunschweig/Germany

Ammonia (NH_3) is a promising fuel as it is carbon free and easier to store and transport than hydrogen (H_2). However, an ignition enhancer such as H_2 might be needed for technical applications due the rather poor ignition properties of NH_3.

In this study, different mixtures of NH_3 and H_2 were investigated in a plug-flow reactor at nearly ambient pressure (970 mbar). Temperature-dependent mole fraction profiles of main species as well as intermediates were obtained in a temperature range between 650 –1200 K using electron ionization molecular-beam mass spectrometry (EI-MBMS). Fuel-lean conditions (φ=0.6) were chosen for all mixtures as these are more likely in technical applications. Special attention was devoted to the possible formation of nitrogen oxides as these emissions would be very harmful to health and environment. Tunable diode laser absorption spectroscopy (TDLAS) has therefore been adapted to the plug-flow reactor as additional analysis method to determine NO concentrations.