

AUTOIGNITION OF ETHANOL AND ETHANOL-BASED GASOLINE SURROGATES FOR AUTOMOTIVE APPLICATIONS



Figure 1: High-pressure shock tube

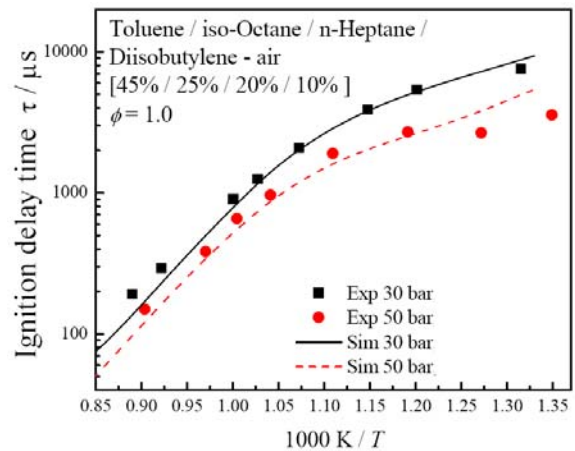


Figure 2: Ignition delay times: Experiments and simulation

The expected shortage in fossil energy resources and the growing need for transportation fuels is continuously increasing the interest in biomass-derived fuels. Fuel blends containing ethanol have become a reality in many countries. The fundamental understanding of the combustion chemistry (especially ignition characteristics) of ethanol-containing fuels, however, has not yet reached the required level.

Ignition characteristics of fuels are analyzed numerically and experimentally by combining measurements in high-pressure shock tubes, test engines and numerical simulations with detailed kinetics models. Shock tubes provide a method for measuring ignition delay times under ideally-premixed and homogeneous conditions. The results of these experiments are then used for the improvement of detailed kinetics models.

Within the scope of this work, ignition delay times of a multicomponent ethanol-based gasoline surrogate mixture will be determined by using the high-pressure shock tube. The experimental results will be interpreted and compared to numerical simulations by using a detailed kinetics model developed at the IVG.

This work includes the following subtasks:

- Study literature with regards to the ignition characteristics of ethanol and ethanol-based gasoline surrogates, as well as numerical modeling of CHEMKIN.
- Perform experiments in the high-pressure shock tube
- Evaluate the experimental data
- Perform numerical simulations of the thermal oxidation (zero-dimensional model) of the multicomponent mixture, by using a detailed kinetics model
- Write a short documentation and present the results of the project

Supervisors:

Prof. Dr. Christof Schulz, Room MA 322, Tel.: +49 (0)203/379-3995,
E-Mail: Christof.Schulz@uni-due.de

Dr. Mustapha Fikri, Room MA 362, Tel.: +49 (0)379-3037,
E-Mail: mustapha.fikri@uni-due.de / leonel@labcet.ufsc.br