

Predictive chemical kinetics towards new standards for smart energy carriers

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Germany, along with its European member states is making a strong energy transition "*Energiewende*", towards sustainable and renewable energy sources as per the roadmap of the EU Clean Energy Strategy 20/20/20. This roadmap requires the reduction of greenhouse gas emissions by 20 %, increasing the share of the renewables by 20% and an increase in the energy efficiency by 20% all by 2050.

Physikalisch-Technische Bundesanstalt (PTB), under the auspices of the Federal ministry of Economics and Energy in Germany, has therefore an important role to play along with its industrial partners towards new standards for liquid and gaseous energy carriers. Research efforts are therefore underway, to develop new standards and measurement techniques for novel energy carriers.

The department "Thermophysical Quantities" at PTB has therefore initiated a new research programme in the metrology of reactive flows in order to unravel chemical mechanisms during energy conversion processes, develop predictive reaction kinetic models and to determine accurate reaction rates of crucial elementary reactions towards development of new standards for gaseous and liquid energy carriers. An example of such activities is towards redefinition of the standard for methane number (knocking propensity for gaseous fuels) for LNG.

A further objective is to have an evaluated kinetic database for combustion and atmospheric chemistry modeling.

This presentation will give an overview of the department activities in reaction kinetics of both conventional and alternative liquid and gaseous energy carriers with a special emphasis on low temperature and high pressure combustion with state-of-the-art experimental techniques coupling diverse reactors to the unique VUV-synchrotron beamline of the Metrology Light Source (MLS) at the PTB.

Finally, new demands that advanced engine technologies and the evolving fuel composition place on investigations of fundamental elementary reaction kinetics will be highlighted.

PTB is the national metrology institute providing scientific and technical services and is the highest technical authority under the auspices of the Federal Ministry for Economic Affairs and Energy (BMWi) in Germany