

Experimental Investigation of Spray Propagation and Mixture Formation of Tailor-Made Fuels under Engine-Relevant Conditions

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Abstract

The aim of this particular project is to specify the desired and tolerable values for the physical fuel properties that are necessary as input for the fuel development in the Cluster of Excellence "Tailor-Made Fuels from Biomass". Therefore this study characterizes the fuel influence on macroscopic and microscopic spray propagation and mixture formation, as there is little known about this influence for most of the fuels under consideration. For this purpose reference fuels of various substance classes have been defined whose physical and chemical properties cover a wide range of potential synthetic fuels. In detail Butanol, Ethanol, Dodecane, Iso-Octane and Tetrahydrofurfuryl Alcohol were analysed using scattering light visualisations and shadowgraphy methods. The investigation of the penetration length supplies information about the influence of the hydrodynamic and thermodynamic fuel properties on atomization and evaporation. The measurements are performed under diesel-engine relevant conditions in a heatable pressurized chamber with optical access. With exception of the ambient temperature the parameters of the measurement system are kept constant. In the case under consideration the wide range of physical properties of the potential tailor-made fuels has a significant influence on spray propagation.

Key words: alternative fuels, diesel injection system, shadowgraphy method

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