Influence of hydrogen on the low temperature combustion of fuels and biofuels

In order to **reduce the environmental impact** of the transport sector, the use of hydrogen from biogas as a fuel is attractive. Hydrogen-powered internal combustion engines demonstrate **higher efficiency and lower emissions** than their conventionally fueled counterparts. However, the influence of hydrogen on the combustion kinetics of fuels and biofuels at **low temperature** (<1000 K) remains **poorly documented**. Under these conditions, the chemistry of combustion is **complex** and depends to a large extent on the structure of the initial fuel. To facilitate the usage of modern fuels with hydrogen, **predictive models** must therefore be constructed and validated.

To study the **impact of hydrogen on the combustion of fuels and biofuels**, experimental studies will be carried out using a **Rapid Compression Machine** on representative species. This laboratory reactor makes it possible to approach the operating conditions of an engine by compressing gas mixtures at temperatures ranging from 600 to 1000 K and pressures from 1 to 30 bar. This reactor allows both the measurement of **ignition delay times**, but also to **sample the reactive mixture** during this ignition delay time, and thus enables the acquisition of global (delays) and detailed (species profiles) validation data for the models.

Missions and goals:

- Understand and deepen the ignition behavior of fuels and biofuels blended with hydrogen in the low temperature range of combustion,
- Evaluate the need for theoretical calculation of reaction rate constants in order to strengthen the description of the combustion of fuels / biofuel and hydrogen,
- Recommend mixtures allowing cleaner and more efficient combustion in internal combustion engines.

Expertise:

The candidate must have a master's degree in chemistry-physics or equivalent. Experience in chemical kinetics, thermodynamics or theoretical calculations will be appreciated.

Keywords:

Clean combustion, oxidation kinetics of fuels, low temperature combustion, kinetic modeling.

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Funding: Requested from Hauts-de-France Region, Labex CaPPA, University of Lille.