International Master 2 Atmospheric Sciences: Research Training 2021-2022

Laboratory: PC2A

Supervisor: LAMOUREUX Nathalie

Tél : 03.20.43.49.30, E-mail : nathalie.lamorueux@univ-lille.fr

Collaborator: DESGROUX Pascale

Eventually,

CaPPA Work Package: WP-1 From gas phase to aerosols (for example)

Species measurements in stabilized premixed flames of NH3/H2/air

Abstract (no more than 2000 characters)

Ammonia is recognized as a possible green energy carrier and can be used as H2-carrier. Ammonia unlike H2 is already deployed worldwide (for agriculture purposes), its transportation is easier than hydrogen which need be stored at high pressure gas or cryogenic liquid. By nature, ammonia is carbon-free and its oxidation offers the possibility of zero-CO2 emission. NH3 can be reduced into H2 and N2. Or it can be used directly in combustion devices (gas turbines, marine engines, …). However, it has a very low heat release compared to fossil fuels, and its combustion can be affected by the occurrence of instabilities. Thus, it requires to be burned with a co-fuel, preferably H2 in order to reach the zero-carbon emission target. The knowledge of the oxidation kinetics of NH3/H2 blend mixtures still must be further improved in order to find the appropriate conditions offering the best optimization for combustion devices.

Today, there are several detailed kinetic mechanisms representative of ammonia combustion. Most have been validated against measurements of global parameters such as laminar burning velocities and ignition delay times. These mechanisms must be consolidated from the measurement of chemical species in stabilized laminar flames.

The work program of this Master internship will consist in measuring the species involved in the NH3/H2 blend oxidation in flames. Species such as NH or NO will be detected and quantified using spectroscopic laser-based diagnostics (Laser-Induced Fluorescence and absorption). Experimental results will be compared to simulated ones using kinetic modeling tools (ChemkinPro or LOGEsoft).

Key words: green energy, NH3, Laser Induced Fluorescence, stablized flames, kinetic chemistry,