Soutenance de thèse

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Raman spectroscopy of soot produced in low pressure flames: ex situ analyses and online gas phase studies

Every year, an amount of 10^7 tons of soot is produced on the world scale. Soot, as part of atmospheric black carbon, has serious impacts on climate change and human health. The impacts depend on many factors including adsorbed compounds, aging and mixing processes. Therefore in order to reduce the soot amount, besides considering these mentioned factors, the study of formation kinetics, structure and optical properties is also essential. There are several methods applied in soot investigations. Raman spectroscopy plays a particular role as it is a powerful tool for structural investigation of the carbon-based materials because it is sensitive to molecular structures.

In this work, differential Raman cross sections of soot and some other carbonaceous particles were measured to progress toward quantitative Raman spectroscopy. Soot particles produced by premixed ethylene flames at a low pressure were investigated by ex-situ Raman measurement on deposited films and in-situ (online) Raman measurement in the gas phase. Combination of the Raman spectroscopy of soot sampled on substrates with infrared and optical spectroscopy and transmission electron microscopy allowed progressing on the interpretation of soot Raman spectra. The online gas phase measurements provided a novel view on soot birth and structures in low pressure flames with, for instance, the detection of a large amount of sp hybrized carbon atoms during nascent soot growth. These studies pave the way to soot detection and analysis directly and quantitatively in the atmosphere.

Key words: Soot, black carbon, Raman spectroscopy, gas phase, low pressure flame

La thèse sera en Anglais

Lundi 20 mars à 14h30

Bât 210 – Amphi 1 (2ème étage)

Université Paris-Sud, 91405 Orsay Cedex

La soutenance sera suivie d'un pot auquel vous êtes chaleureusement conviés.