Université de Lille

FACULTÉ DES SCIENCES ET TECHNOLOGIES

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Eventually CaPPA Work Package: WP2

SUPER-HYDROPHOBIC SURFACES FOR THE STUDY OF INDIVIDUAL AEROSOLS

The deposition of particles on a surface is a technique widely used for the characterization of single aerosols.[1] However, in the study of the physico-chemical processes of individual aerosols in the laboratory, the contact surface can influence certain processes and distort the results. [2] Moreover, some authors use hydrophobic substrates in order to reduce the influence of the support.[3] The objective of this project is to study the potential of super-hydrophobic substrates with different textures and natures for the study of the reactivity of atmospheric aerosols in the laboratory, at the single-particle scale.

In this training research, super-hydrophobic substrates will be fabricated and characterized at IEMN laboratory and then, tested on single aerosols at LASIRE laboratory. More precisely, the surfaces must ensure very little contact between the drop and the surface, and be inert under humidity and reactive environment conditions. Moreover, the development and testing of a super-hydrophobic transparent surface, to be used with the optical tweezers available at LASIRE is planned. The idea is to manipulate several drops at the same time on a super-hydrophobic and smooth surface and to study the coagulation between droplets of similar or different nature (sliding of the drops by the optical tweezers on the surface). This experiment is very difficult to perform by levitating the drops in the air. The surfaces will be exposed to reactive gases, relative humidity and light, in order to check their stability. They will also be characterized by surface analysis techniques (SEM, AFM) before and after treatment.

Key words: single aerosols, super-hydrophobic surfaces

[1] A. P. Ault and J. L. Axson, Atmospheric Aerosol Chemistry: Spectroscopic and Microscopic Advances, Anal. Chem., 2017, 89, 430–452.
[2] V. G. Ciobanu, C. Marcolli, U. K. Krieger, U. Weers and T. Peter, Liquid−Liquid Phase Separation in Mixed Organic/Inorganic Aerosol Particles, J. Phys. Chem. A, 2009, 113, 10966–10978.
[3] U. K. Krieger, C. Marcolli and J. P. Reid, Exploring the complexity of aerosol particle properties and processes using single particle techniques, Chemical Society Reviews, 2012, 41, 6631–6662.