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Optical Trapping in the Study of the Air/Water Interface Effects in Tropospheric Chemistry

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The scientific and technological advances on optical trapping enables the possibility of investigate air/water interface phenomena at the scale of the single droplets, from few to tens micrometers of size. In this work, the commercially available optical tweezers (Biral AOT-100 [1]) have been employed to study the activation of halogenated radicals in large droplets, a key process in tropospheric chemistry [2]. The setup provides a characterization of the trapped particle of the size and refractive index via the analysis of the stimulated Raman whispering gallery mode resonances, as well as the control of the local humidity of the trapping cell and an excellent time resolution. In this specific study the formation of halogens is monitored using the structures of the Raman resonances [3], with a focus on the air/water interface effect in function of the size of the particle. Furthermore, the setup has been modified in order to provide the possibility of fluorescence spectroscopy investigation on the trapped particle. This particular home-made feature is exploited to study another air/water interface effect, the production of hydrogen peroxide at the air/water interface, induced by the intrinsic electric field, on the micron-size droplet scale. This performed with the use of terephthalic acid to monitor the OH radical formation, that represents the main cause of hydrogen peroxide production [4].

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