Plasma in contact with liquids: physics and chemistry issues and applications to biology and agriculture

Bruno Honnorat, Bo Liu, Constance Duchesne, Thierry Dufour, Antoine Rousseau

Laboratoire de Physique des Plasmas, Ecole Polytechnique, UPMC, CNRS, France

The study of cold atmospheric-pressure plasmas and their interaction with liquids is a subject of considerable interest in fields such as water treatment, plasma-medicine or agriculture. Several chemical species are produced by the plasma discharge directly in the liquid or in the gas phase. The study and the quantification of all these long and short lifetime reactive species in liquids and in the gas phase are very important to improve our understanding of the complex interaction between plasma and its biological target. ROS (reactive oxygen species) are particularly interesting because they are involved in a lot of biological functions essential to life.

In the present study, Helium plasma jets and Dielectric Barrier discharges have been set-up. The energy transfer from the plasma to the liquid is first analysed as a function of working parameters (Voltage, distance, gas flow).

Then, reactive oxygen and nitrogen species such as O_3, $OH°$, H_2O_2, NO_2^-, NO_3^- have been identified.

Finally, the biological activity of plasma treated liquids is shown in the field of Plasma agriculture and plasma medicine.

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