Title	**Cold plasma activation of microalgal growth**
PI	MAROTTA Ester
Research Group	Organic Chemistry for the Environment and Health – DiSC
Curriculum	Scienze Chimiche
Contact	**web:** www.chimica.unipd.it/ester.marotta
	email: ester.marotta@unipd.it

Project description:

State of the art: Plasmas at ambient conditions (*cold* plasmas) are becoming powerful tools to activate chemical processes including advanced oxidation for air and water decontamination, materials and biomaterials treatments and biomedical applications. New frontiers are opening up in the fields of agriculture and nutrition, for which the knowledge, intuition and skills of chemists are strongly needed.

Objectives and activity: Food shortage is one of humankind major problems. The project is a proof of principle study of the possibility of using cold plasma to stimulate the growth of edible microalgae. Spirulina (Arthrospira), a cyanobacterium rich in nutrients (proteins, lipids, carbohydrates, vitamins and minerals) will be used as model. Cold plasmas in air/water systems produce ROS which can stimulate growth mechanisms. The project will be carried out within an established network of interdisciplinary collaboration to provide the required competences in engineering, plasma physics and biology. The PhD student will be involved in the characterization of the plasma, based on spectroscopic and chemical analysis of major reactive species, including short lived molecular excited states, OH radicals and hydrogen peroxide, and in the chemical and biological characterization of the plasma treated microalgae to determine its content in proteins, sugars, lipids, vitamins, carotenoids, chlorophyll, to measure the biological activity of the enzymes and the photosynthetic activity of the microalgae.

Skills to be acquired and opportunities: The PhD student will use various analytical techniques, such as HPLC-UV/Vis and HPLC-mass spectrometry, optical emission spectroscopy, and develop skills in the analysis of complex matrixes and in the use of chemical and biochemical mechanistic and kinetic tools. The candidate will work in a stimulating multidisciplinary environment in Padova and will have the opportunity to spend a research stage abroad at one laboratory within an established international network.

Publications:

- S. Krishna, E. Ceriani, E. Marotta, A. Giardina, P. Špatenka, C. Paradisi. Products and mechanism of verapamil removal in water by air non-thermal plasma treatment, Chem. Eng. J. 2016, 292, 35-41.
- B. M. Cadorin, V. D. Tralli, E. Ceriani, L. O. Benetoli, E. Marotta, C. Ceretta, N.A. Debacher, C. Paradisi. Treatment of methyl orange by nitrogen non-thermal plasma in a corona reactor: The role of reactive nitrogen species, J. Hazard. Mater. 2015, 300, 754-764

Collaborations/Network:

Emilio Martines and Matteo Zuin, CNR Istituto Gas Ionizzati – Consorzio RFX, Padova
Paola Brun, Dipartimento di Medicina Molecolare, Università di Padova
Matteo Pavan, Microlife S.r.l.