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Synthesis and characterization of Carbon Dots from agro-industrial waste and their use for the removal of pollutants in aqueous matrices

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Research Doctorate Course in Materials Engineering and Structures and Nanotechnologies - XXXVII Cycle

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Nowadays water pollution is one of the greatest problems worldwide. The work aims to synthesize and characterize Carbon Dots (CDs) and the use of a more environmentally friendly and green materials and method to prepare high-quality CDs is considered.

We will survey the usage of carbon dots as a potential water disinfection agent especially for photocatalytic degradation of recalcitrant organic pollutants and antibacterial water disinfection. Emphasis is given to the use of agro industrial wastes.

In this context, the use of a more environmentally friendly and green materials and methods to prepare high-quality CDs are considered. Based on the pace of carbon dot research world- wide, in the future, we can expect the advent of more facile and robust synthetic routes and creative applications to better realize the potential of the increasingly important CD materials.

Part of the research will be carried out using the pilot plant made available by the company AquaSoil, implementing in parallel the necessary support activities of the Laboratory for Chemical Technology of the Department of Engineering for Innovation of the University of Salento and the Department of Chemical and Biochemical Engineering of the Western University.

Biomasses can be used as a green sources for the synthesis of carbon dots. CDs will be produced by environmentally friendly processes. Different microscopy techniques as well as X-ray diffraction analyses will be used for characterize (agro) industrial materials. FT-IR spectroscopy and elementary analysis help in recognizing the surface functional groups which mark CDs' affinity properties and signify chemical mechanisms and also (MTT) assay is a common in vitro test to analysis toxicity the nanosystems.

In summary, the addition of CDs on photocatalytic systems has an important role in their performance, mainly because of their up-conversion property, transfer photoinduced electron capacities, and efficient separation of electrons and holes. Thus, CDs-based photocatalysts can be considered as an efficient alternative for decontamination water matrices by emerging contaminants.



AquaSoil SrL is a company that designs and manages integrated services in the environmental field, specializing in the refining and distribution of urban wastewater for the purposes of agricultural and environmental reuse.

The experience gained in the field in over many years, together with the participation in numerous national and international research initiatives, has allowed the company to develop specialized skills in the management of the ordinary and extraordinary phases of processes and refinement technologies, and in particular in the development and management of advanced purification processes capable of removing anomalous polluting materials.

The many years of experience acquired over time in the field of monitoring and modeling of the environmental effects deriving from reuse activities makes AquaSoil the contractor for the management service of the urban wastewater.



Western University (www.uwo.ca) located in the city of London Ontario ranks as one of Canada's top research-intensive universities.

The university operates twelve academic faculties and schools which boasts researchers, teachers and graduate students who are leaders in their fields and conduct innovative research in some of the world's most exciting and emerging areas. School of Chemical and Biomedical Engineering promotes the cooperative involvement of clinical and basic researchers in discipline including [biomaterials](#), [biomechanics](#), [mechatronics](#). Great engineering careers are built on leadership and innovation. The most respected companies in the world rely upon critical thinking and analytical skills to achieve breakthrough engineering technologies. Leaders in these organizations seamlessly blend engineering and business perspectives to resolve important problems facing society.