BIOENGINEERING & BIOMEDICAL ENGINEERING RESEARCH SEMINAR

TOWARDS GREENER ELECTRONICS

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Clara Santato is a Full Professor in the Department of Engineering Physics at Polytechnique Montréal. She earned her PhD degree in chemistry ("Preparation and Characterization of Nanostructured WO3 Films as Photoanodes in Photoelectrochemical Devices") in 2001 from the Université de Genève, and her MSc degree ("Electropolymerization and Photopolymerization of a Pyrrole-Substituted Ruthenium tris (bipyridyl) Complex") in chemistry in 1995 from Università degli Studi di Bologna. The experimental work was carried out in collaboration with Université J. Fourier. She was a (permanent) research scientist at the Institute for Nanostructured Materials, part of the Italian National Research Council, from 2001 to 2011, and a visiting scientist (2007–2010) at Cornell University, Department of Materials Science and Engineering (Malliaras Laboratory for Organic Electronics). In 2006, she was a visiting scientist with a cross-appointment between the Institut National de la Recherche Scientifique and McGill University (Chemistry), and in 2005, at Purdue University (Chemistry).

Santato's research focuses on semiconducting films and their interfaces with metal electrodes and electrolytes, for applications in transistors and energy conversion/storage, and has been recently recognized by her elevation to the Institute of Electrical and Electronics Engineers (IEEE) senior membership. With her group, she recently expanded her research interests to green electronic and energy-storage devices.

Santato is a member of the UNESCO MATECSS (Materials and Technologies for Energy Conversion, Saving and Storage) Chair. She serves as an associate editor of the Journal of Power Sources (Elsevier).

ABSTRACT

Electronics have become indispensable in our daily routine. A great part of the electronic equipment that surrounds us belongs to what is known as conventional electronics, based on inorganic materials such as silicon and gallium arsenide. However, with the life of the electric and electronic equipment becoming shorter and shorter, two major issues arise for both the scientific community and municipalities: the increasing amount of Waste of Electrical and Electronic Equipment (WEEE) and the depletion of natural resources. Taking into account the definition of sustainability provided by the United Nations (the ability of satisfying one generation's needs without compromising the possibility of future generations to satisfy), those two issues point to the lack of sustainability in the electronics field of the current generation, at least so far. Consequently, great attention has been given to green (sustainable) electronics in the last years, having as core values (i) the use of abundant and low-cost precursors, leveraging on processing routes that (ii) lack toxic solvents as well as toxic waste and (iii) are low cost and (iv) involve biodegradable materials. In this contribution, we will present our preliminary results on the biodegradability and compostability of organic electronic materials of interest for electronics and energy storage devices, focusing on the case of study of melanin biopigments used in transistors, batteries and supercapacitors [1].

[1] E. Di Mauro, R. Xu, G. Soliveri, C. Santato, Natural melanin pigments and their interfaces with metal ions and oxides: emerging concepts and technologies, MRS Commun. 7 (2017) 141–151. doi:10.1557/mrc.2017.33.

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