Titolo:

Using food waste as a source of building blocks for sustainable materials

Abstract:

The food industry is responsible for 30% of total greenhouse gas emissions, and requires transformative technologies to join the battle against climate change. New circular systems in which food waste and food byproducts, for example, are transformed into high added value materials is paramount to achieve UN Sustainable Development Goals: providing new value to the energy and labor used to produce those byproducts and at the same time providing opportunities for replacing fossil resources with renewable ones. The adoption of this circular model requires the development of new enabling green chemistry technologies that can transform waste into building blocks and then materials with adequate performance. The focus of my research activity has been the development of these technologies and in this seminar, I will present the most recent results and an outlook for the future.

I divided food waste into three main categories: polysaccharides, proteins and hydrophobes. For each of the categories, I will show how the development of new green processes can repurpose food byproducts into materials with useful properties and how, the study of the structure-property relationship of food byproducts, can lead to the development of high performance materials for technology.

In technology (e.g. electronics), this circular transition is still in its infancy, but the development of key enabling technologies that allows the conversion of biomass into materials for technology could lead to a change of paradigm for technology: from one made with hard, fossil and often time toxic materials, to technology made with biobased, renewable and biological ones.

Successful implementation of this approach will have huge and partially unexplored potential from sustainable advanced technologies (new generation of green technological devices), to nanomedicine (new drugs, nutraceuticals and formulations) and I believe that it can lead to the development of a more sustainable society.

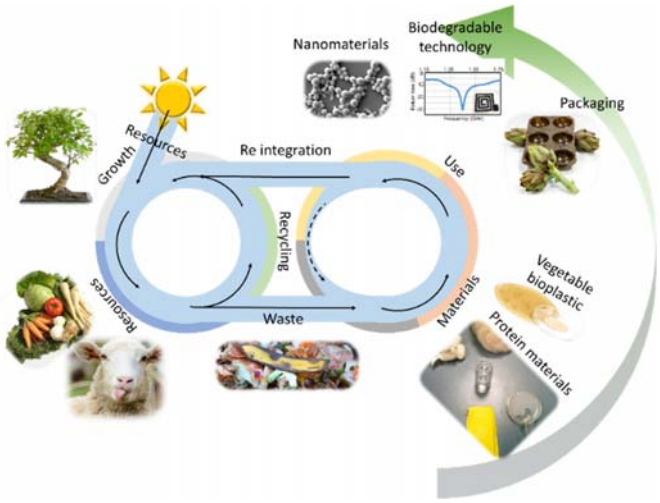

Figure 1: The development of green chemistry technologies can provide tool to transform waste and byproducts in high value-added materials.

Bio:

Giovanni Perotto is a Researcher at the Istituto Italiano di Tecnologia, in Genova. After visiting for few months the European Synchrotron Radiation Facility in Grenoble during his master thesis, he obtained a PhD in Material Science and Engineering from the Università di Padova. After the PhD he spent three years at Tufts University in Boston (MA), working on the material science of silk fibroin in the SilkLab.
He joined IIT in 2015, working on developing material technologies for the circular economy, pioneering the transformation of food waste into new high added value materials. Examples are packaging made of non-edible portions of fruits and vegetables, transformation of proteins such as keratin into materials for electronics and developing a new generation of reverse engineered proteins for plastic replacement and for advanced technologies. He also contributed to the development of fish leather, mitigating the environmental impact of fisheries. Developing the material technologies to upcycle food waste and byproducts, is one of the key technologies for the development of a circular economy of the food industry and to create a more sustainable society. He received funding to support his research from EU projects, Foundations (Fondazione Cariplo) and companies. He published more than 65 papers and two book chapters, with more than 1900 citations and H-index of 26, as reported by scopus: https://www.scopus.com/authid/detail.uri?authorId=36476454900