DIPARTIMENTO DI SCIENZE CHIMICHE

UNIVERSITÀ DEGLI STUDI DI PADOVA

Can Green Chemistry technologies enables a new Circular Economy paradigm for food by-products?

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18 novembre ore 15.30 Aula F

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The food industry is responsible for 30% of total greenhouse gas emissions, and requires transformative technologies to join the battle against climate change. Reutilization of food waste and food byproducts, for example, is paramount to achieve UN Sustainable Development Goals. A circular economy paradigm is regarded as a possible sustainable way for valorization of the non edible waste and byproducts: they can become a new, renewable and sustainable source of raw materials, replacing fossil and non renewable sources, while also providing new value to the energy and labor used to produce those byproducts. The adoption of a circular economy model for biopolymers, requires the development of new enabling green chemistry technologies. 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.
Food waste was classified into three main types: polysaccharides, proteins, and hydrophobes. For each category, new green processes I developed, demonstrate how food byproducts can be repurposed into materials with valuable properties, with structure-property studies supporting the development of high-performance materials fully derived from waste valorization. This approach has driven the valorization of vegetable byproducts to create 100% plant-based biocomposites, suitable for applications such as food packaging and agricultural mulches, recognized by Legambiente as one of its '100 Circular Economy Stories.' Early LCA metrics indicate that this circular method may be more environmentally favorable than traditional polyolefin production. The successful application of this strategy offers substantial potential across fields, from food waste reduction and sustainable materials to green technologies and nanomedicine, contributing to a more sustainable society

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