

1/Title

Innovations in Bio-Based Chemicals and Materials: A Colloidal Systems Approach

2/Abstract

Most developments in colloid science have relied on mineral and petroleum-derived polymers that achieve well-defined chemical and dimensional characteristics. Unfortunately, it is challenging to attain such control when considering renewable nanoparticles. Herein, I introduce some emblematic cases associated with our recent work that highlight the great possibilities of biobased-colloids obtained from plant biomass and residues. I show the control over renewable particle size and shape heterogeneity, highly relevant to the design of photonic coatings and supracolloidal assemblies. We propose a pathway toward selectable biobased particle size and physicochemical profiles. The correlation that exists between size and physicochemical characteristics (molar mass, surface charge, bonding and functional groups, among others) is offered as a powerful route to identify technological uses that benefit from the functionality and cost-effectiveness of biogenic particles. I further discuss processing routes that transforms low-value, residual biomass and use examples to synthesize all-green materials from polysaccharide and aromatic structures. These are demonstrated for their recyclability and biodegradability in natural environments, addressing the limitations of circularity and end of life of non-renewable products. Given the low-cost of the raw materials, their natural micro-structural design and self-adhesion, this presentation shows fully sustainable alternatives to products based on non-renewable carbon. The impact of related technologies is shown to depend on our ability to control water interactions and gelation phenomena.

References:

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3/Photo



4/ Speaker Profile

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Professor Orlando Rojas is the Canada Excellence Research Chair at the University of British Columbia and Director of the Bioproducts Institute. His research focuses on bio-based materials and soft matter. He is internationally recognized for his contributions to renewable materials science, and has received several prestigious honors, including the **Anselme Payen Award**, the highest distinction in cellulose and renewable materials research.

He is an elected Fellow of the **American Chemical Society** (2013), the **Finnish Academy of Science and Letters** (2017), and the **TAPPI Association** (2025). Earlier in his career, he served as a **Finland Distinguished Professor** and was named an inaugural **Faculty Scholar** at North Carolina State University.

Prof. Rojas maintains active collaborations with institutions across Europe, the Americas, and Asia. He serves on the **Selection Committee of the Marcus Wallenberg Foundation** and holds scientific advisory roles with organizations including the **Max Planck Institute of Colloids and Interfaces**, the **VALUED Project** (with Imperial College London, University of Bristol, and University of Cambridge), and the **Materials Institute of the University of Santiago de Compostela**.

He is **Emeritus Editor** of the *Journal of Dispersion Science and Technology* and **Associate Editor** of *ACS Biomacromolecules*. He is ranked among the **top 1% of researchers globally by citations** (Clarivate, Web of Science).