Self-assembly of Carbohydrate Block Copolymers: From glyconanoparticles to thin films to photonic crystals

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To date, numerous studies have been focused on the self-assembly of petroleum-based BCPs for potential applications in multidisciplinary fields, such as nanoparticles for drug delivery, or nano-organized films for biosensors, or nanolithography, etc. Such materials are derived from fossil resources that are being rapidly depleted and have negative environmental impacts. In contrast, carbohydrates are abundant, renewable and constitute a sustainable source of materials. This is currently attracting much interest in various sectors and their industrial applications at the nanoscale level will have to expand quickly in response to the transition to a bio-based economy. The self-assembly of carbohydrate BCP systems[1-4] at the nanoscale level via the bottom-up approach, has allowed the conception of nanostructured thin films and nanoparticles (micelles, vesicles,…) whose external shell is made from carbohydrates. We will present recent results on the self-assemblies of carbohydrate-based block copolymer leading to nanoparticles presenting different shapes (spherical, cubic, …), highly nanostructured thin films for nanobioelectronic applications and more recently brush-like glycopolymers exhibiting photonic crystals behavior leading to colored materials.[5]

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Before his actual position, he served as the Director of CERMAV (Grenoble) and the group leader of polymer physico-chemistry group at Bordeaux (LCPO). He earned his PhD in polymer sciences at Louis Pasteur University at Strasbourg and spent a post-doctoral position at the Max-Planck-Institute in Mainz, Germany. He also was a visiting Professor at Stanford University, California, USA & and Visiting Scientist at IBM, Almaden, CA, USA

Expertise: Self-assemblies of Carbohydrate-based block copolymers (BCP) systems, leading to:

- Nanostructured Thin films: highlight of properties/applications in nano-electronics including: (smart surfaces, nanolithography, photovoltaic, memory transistors, HR-biosensors, etc.…), Directed Self-Assembly (DSA)
- Nanoparticles (micelles) & Polymersomes & their properties/applications in cosmetic/biomedical