

# Controlled Self-Assembly of Polymeric Amphiphiles Driven by Crystallization



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## Résumé/Abstract

Molecular, and more recently, macromolecular synthesis has evolved to an advanced state allowing the creation of remarkably complex organic molecules and well-defined polymers with typical dimensions from 0.5 nm - 10 nm. In contrast, the ability to prepare materials in the 10 nm – 100 micron size regime with controlled shape, dimensions, and structural hierarchy is still in its relative infancy and currently remains the virtually exclusive domain of biology.

In this talk recent developments concerning a promising “seeded growth” route to well-defined 1D and 2D nano- and microparticles termed “living” crystallization-driven self-assembly (CDSA), will be described. Living CDSA can be regarded as a type of “living supramolecular polymerization” that is analogous to living covalent polymerizations of molecular monomers but on a much longer length scale (typically, 10 nm – 5 microns). Living CDSA also shows analogies to biological “nucleation-elongation” processes such as amyloid fiber growth.

The building blocks or “monomers” used for living CDSA consist of a rapidly expanding range of crystallizable amphiphiles such as block



copolymers, homopolymers with charged termini, or planar  $\pi$ -stacking molecules with a wide variety of chemistries. The seeds used as “initiators” for living CDSA are usually prepared from preformed polydisperse 1D or 2D micelles by sonication.

Recent results indicate that living CDSA is scalable, which will help enable applications in areas such as optoelectronics, catalysis, and biomedicine, and recent examples of work by our group and our collaborators in these areas will be discussed.<sup>1-4</sup>

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## Bio

Ian Manners received his Ph.D. in the UK and then conducted postdoctoral work in Germany and the USA. He then joined the University of Toronto, Canada as an Assistant Professor in 1990 and was promoted to Full Professor in 1995 and was made a Canada Research Chair in 2001. His return to the UK in 2006 to the University of Bristol was supported by an EU Marie Curie Chair. In 2018 he was awarded a Canada 150 Research Chair at the University of Victoria, Canada. He also holds a visiting professorship at Shanghai Jiao Tong University, China. Ian’s work is documented in ca. 750 career publications and 4 books and has been presented in ca. 560 invited lectures worldwide. He is an elected member of both the Canadian and the British National Academies of Science.

