

Synthetic chitin nanocrystals and their assemblies

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Nanochitin, an extraction product of the most prevalent biopolymer in the ocean (chitin),¹ has appealing qualities as biocompatible and biodegradable material.² Although its outstanding material properties, it is still one of the least utilized biomass resources. The common top-down approaches to extract and isolate nanochitin from natural precursors often result in undefined chemical compositions making it nearly impossible to establish rational correlations between three-dimensional structures and macroscopic properties.³

Following a bottom-up approach,⁴ we used automated glycan assembly (AGA) to prepare well-defined chitin oligomers as tools to understand the transfer of chirality from the single oligomer to supramolecular assemblies. Simple oligomers self-assembled into synthetic chitin nanocrystals that we characterized at the molecular level with electron and atomic force microscopy. These nanocrystals further assembled into bundles with intrinsic chiral features. We discovered the profound impact of water on the assembling process, enabling us to control and fine-tune the nano-scale morphology. This knowledge will expand our understanding of chitin, providing essential guidelines for the generation of well-defined chitin-based materials.

Bibliographic references:

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