



ZELLCHEMING-CONFERENCE

CELLULOSE-BASED MATERIALS –  
FROM SCIENCE TO TECHNOLOGY

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### **High-yield preparation of non-chiral chitin nanocrystals for supracolloidal construction**

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### **Abstract**

The complex nature of biocolloids and ensuing interparticle interactions challenge our understanding of their supracolloidal self-assembly. This applies to biological nanoparticles, which offer unique opportunities for their chirality and tailorable surface energy. In this regard, chitin stands out given its potential for the development of functional materials, which remains largely unexplored. Here we propose a high-yield synthesis of chitin nanocrystals by heterogeneous acid hydrolysis of never-dried chitin. Partial deacetylation facilitates control over the balance of electrostatic charges and therefore nanocrystal topology, as shown in cryo-TEM and AFM. We show that the synergy between lateral disassembly and surface etching leads to individual nanocrystals that display no net chirality (electron tomography reconstruction analysis). The obtained nanocrystals facilitate alignment in supracolloidal constructs, demonstrated by interfacial nanoparticle complexation with TEMPO-oxidized cellulose nanofibrils, yielding continuous, strong microfibers after dry spinning. Which enrich the biobased alternatives for potential supracolloidal assembly under the all-natural concept.



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**KEYWORDS:**

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Nano-polysaccharides  
Surface deacetylation  
Electron tomography  
Chirality  
Twisting behavior  
Supracolloidal assembly  
TEMPO-cellulose fibrils  
Cryo-TEM

**Biography**

Long Bai obtained his B.E. degree in 2011 in polymer material and engineering from Northeast Forestry University (NEFU), PR China and his Ph.D. degree in biomass material and engineering from NEFU in 2016. He is currently working in Prof. Orlando Rojas group in University of British Columbia, Canada. His research interests include the design and preparation of multiphase systems (e.g., emulsions) from biocolloidal nanoparticles (e.g., nanocellulose and nanochitin) with a focus on the development of biobased multifunctional materials.

