



CMCC Mechanochemistry Discussions

Online Seminar Series

Mechanochemical and Aging Techniques Towards the Functionalization of Polymers and the Transformation of Biomass into Functional Materials

**Livestreaming at
10:00 AM (CT)**

THURS., April 21, 2022

on the CMCC YouTube Channel:

<https://www.youtube.com/channel/UC7eCYPKbGTKpgO7W2bNABxg>



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Mechanochemistry is becoming an established method for the sustainable, solid-phase synthesis of scores of nanomaterials and molecules, ranging from active pharmaceutical ingredients to materials for cleantech. As the community is learning more mechanical activation and reactivity, we realise that mechanochemistry is not only a means to deliver energy to a chemical system, but also a way to activate precursors and mix reagents that may react further in a subsequent aging phase. We have first explored these concepts for the functionalization of polymers, including polyethylene glycol, polycarbonates. We explored similar ideas towards the phosphorylation of cellulose nanocrystals. We discovered we could use this technique to tackle the difficult transformation of chitin into chitosan, a highly praised material in the biomedical sector for its antibacterial properties, which finds also important application as a fertilizer, water treatment flocculant and food additive. We showed that mechanochemistry and aging could be used effectively for the deacetylation of chitin. This process yielded high molecular weight chitosan with minimal use of energy and solvent. This process affords chitosan in a safer fashion and with less materials and energy usage compared to the classic hydrothermal one. We have also extended this method to the fabrication of chitosan nanocrystals from chitin nanocrystals. Chitin and chitosan nanocrystals featured enhanced properties are nanocatalysts supports. We have also developed hydrogels from chitosan and chitin nanocrystals, with exceptional gelling properties and demonstrated their applicability for slow drug release.



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