PURDUE INNOVATES | Office of Technology Commercialization

Formulation for Controlled Dispersion of Cellulose Nanomaterials

A new polymer shear mixing process using carboxymethylcellulose enables controlled dispersion and improved, homogenous drying of sustainable cellulose nanomaterials, overcoming traditional agglomeration issues.

Researchers at Purdue University have created new process for controlled dispersion of cellulose nanomaterials using carboxymethylcellulose. Cellulose nanomaterials materials are desirable as they are sustainable, biodegradable, and highly abundant in nature. CNCs can be used in cosmetic, composite, paint, ink, gas, packaging, construction, and food applications â€“ to name a few. Currently, agglomeration of CNCs can occur as they are dried, and processes used to reduce this effect traditionally involve costly, energy-intensive methods as well as often compromise material properties. Purdue researchers have combined a polymer shear mixing technique to create CNC and a CMC dispersion that allows for redispersion the material. The technique can also hinder redispersion as desired by soaking the dispersion in multi-valent salt solutions or dilute acids. Further, this improves the material's ability to dry evenly and homogenously.

Advantages:

-Sustainable Materials

-Improved Drying Step in CNC/CMC Material Development

Potential Applications:

-Material Science and Engineering

-Composites

-Construction

-Packaging

Technology Validation:

Technology ID
2021-YOUN-69372

Category
Materials Science & Nanotechnology/Nanomaterials & Nanostructures
Materials Science & Nanotechnology/Composites & Hybrid Materials
GreenTech/Sustainable Packaging Materials

Authors
Sami El Awad Azrak
Endrina Forti
Robert Moon
Gregory Schueneman
Jeffrey P Youngblood

Further information
Dipak Narula
dnarula@prf.org

View online

The charge potential was tested for pure CNC versus the CNC + CMC mixture at various stages in the drying process.

Recent Publication:

"Enhanced dispersion and properties of a two-component epoxy nanocomposite using surface modified cellulose nanocrystals"

Polymer, a journal of Materials Today

DOI: 10.1016/j.polymer.2017.02.016â€‹

TRL: 3

Intellectual Property:

Provisional-Patent, 2021-03-15, United States | NATL-Patent, 2022-03-15, Finland | PCT-Patent, 2022-03-15, WO | NATL-Patent, 2022-03-15, Canada | NATL-Patent, 2022-03-15, United Kingdom | Utility Patent, 2022-03-15, United States | CON-Gov. Funding, 2025-09-09, United States

Keywords: Cellulose nanomaterials, carboxymethylcellulose, controlled dispersion, CNC, CMC, polymer shear mixing, redispersion, sustainable materials, composites, packaging, Carbon Nanotubes, Composites, Construction, Construction Technologies, Materials and Manufacturing, Materials Science, Mechanical Engineering, packaging