# Ultrasound technology accelerates drying of renewable cellulose nanocrystals

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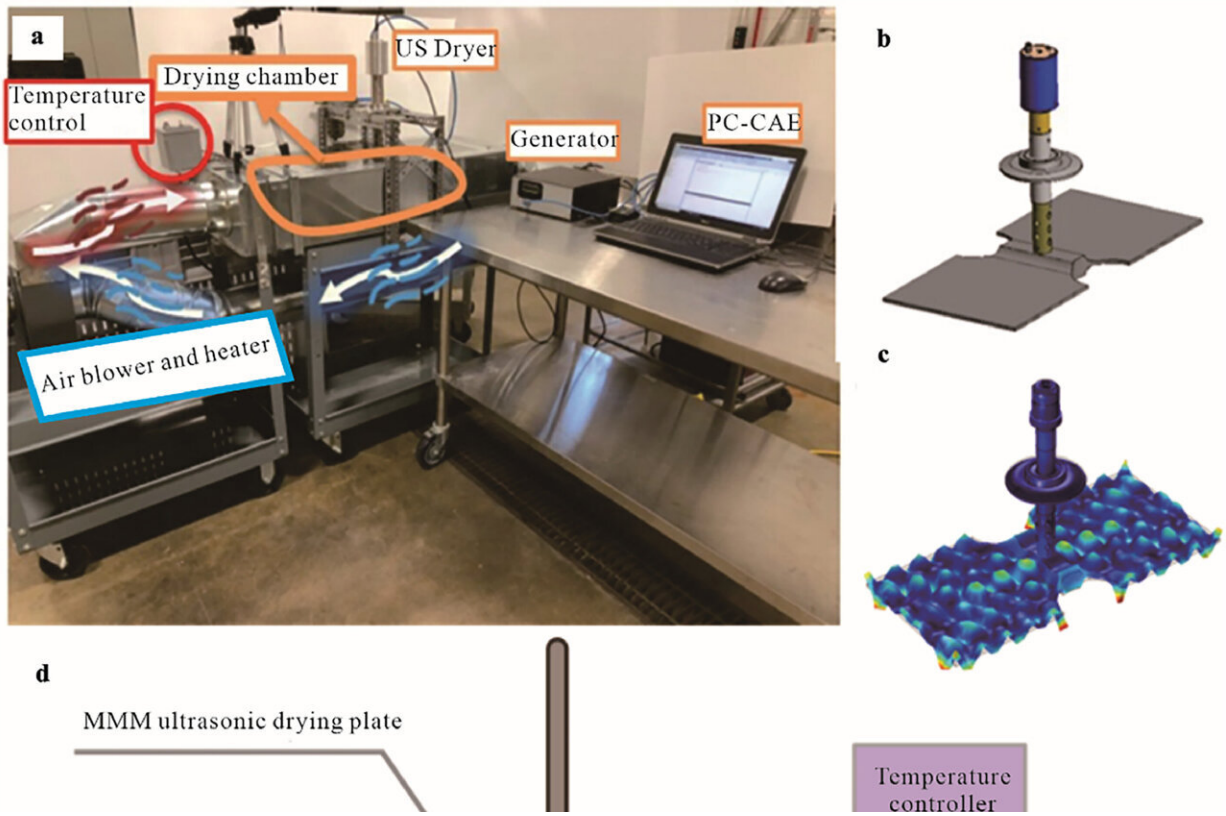


A new ultrasonic drying method enhances efficiency and sustainability in the production of cellulose nanocrystals (CNCs). Credit: Department of Food Science and Human Nutrition, University of Illinois Urbana-Champaign

The global transition towards sustainability has sparked significant interest in bio-based materials and energy-efficient technologies. Among

these, cellulose nanocrystals (CNCs), derived from renewable resources, have shown great potential for use in composites, biomedical materials, and packaging. However, a major challenge in CNC production is the energy-intensive drying process, which often requires removing large amounts of water from low-concentration suspensions.

To address this issue, a team of researchers at the University of Illinois Urbana-Champaign and Purdue University has introduced a novel multi-frequency ultrasonic drying technology. This method not only accelerates the drying process but also reduces energy consumption compared to traditional drying techniques such as hot air, spray, and freeze drying.

The research is published in the *Journal of Bioresources and Bioproducts*.

The study compared the drying kinetics, product quality, and energy efficiency of various drying methods. The ultrasonic drying process resulted in a remarkable 50% reduction in drying time over hot air drying, with minimal change in particle size, indicating excellent redispersibility.

Moreover, the ultrasonic drying method demonstrated superior stability in aqueous solutions, with zeta potentials ranging from -35 to -65 mV, a critical factor for the colloidal stability of CNCs.

In terms of energy consumption and $CO_2$ emissions, the ultrasonic drying technology outperformed other methods. The specific energy consumption was significantly lower, and the potential $CO_2$ emissions could reach net-zero if renewable electricity is used. This innovation aligns with global efforts to reduce greenhouse gas emissions and achieve net-zero goals.

The researchers concluded that ultrasonic drying is a promising,

sustainable method for drying CNCs, offering a scalable solution for the biomaterials industry. This method not only enhances the efficiency of CNC production but also supports environmental sustainability by minimizing energy use and carbon emissions.

**More information:** Junli Liu et al, Comprehensive comparison of cellulose nanocrystal (CNC) drying using multi-frequency ultrasonic technology with selected conventional drying technologies, *Journal of Bioresources and Bioproducts* (2024). DOI: 10.1016/j.jobab.2024.07.003

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