

GreenCNC  
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# Towards realistic, green, and low-cost production of cellulose nanocrystals

## WHAT AND WHY?

Cellulose nanocrystals (CNCs) are a sustainable, renewable, nontoxic and biocompatible nanomaterial prepared from pulped wood fibres. Among numerous other applications, they have been envisaged as a key component in biodegradable composites that could replace plastics in the future. However, industrial production of CNCs is costly because of the complicated processing steps involved.

## HOW AND WITH WHOM?

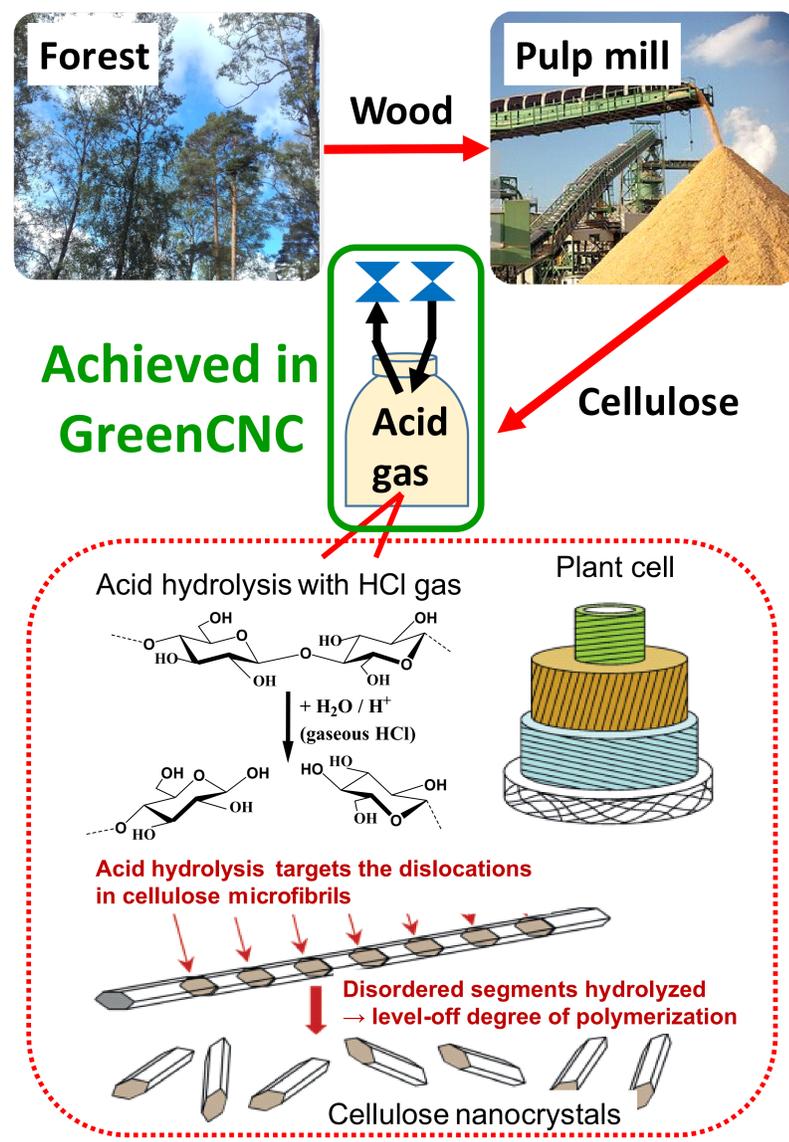
The current production of CNCs is based on a heterogeneous system of liquid acid and solid fibers. GreenCNC has pioneered a method that utilizes gaseous acid. The advantages are numerous: acid gas is easier to recycle, the products do not need purification, and the yields are superior to the conventional liquid/solid method. With the help of SciTech-Service, a Finnish SME in the forest sector, a custom made reactor for gas/solid hydrolysis was built and extensively trialed.

## RESULTS, IMPACT AND RECOMMENDATIONS

With pressurized hydrogen chloride gas, the custom-built reactor demonstrated a complete hydrolysis down to cellulose crystallites in less than 2 hours reaction time at room temperature. Close to 100% yields of CNCs were obtained upon dispersion of the hydrolyzed product in a proof-of-concept study as opposed to 30-60% yields in the conventional liquid/solid systems. Full technical feasibility was described in a concept report, prepared by SciTech-Service. This paves way to further industrial takeover with piloting and subsequent full scale production.

### What next?

Creating of a viable dispersion process for the hydrolyzed cellulose is a next step. We are currently identifying a major industrial partner for commercialization.



Acid hydrolysis of cellulose with pressurized HCl gas is introduced as a novel process with cellulose nanocrystal production. Cellulose nanocrystals can be applied with numerous industrial applications.

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