

# How improving deuteration of cellulose helps probe its molecular structure and solvent interactions

## Scientific Achievement

We provide an overview of recent advances in cellulose deuteration methods, both by biological and by chemical means, including characterization and application of deuterated cellulose, and the resulting structural insights.

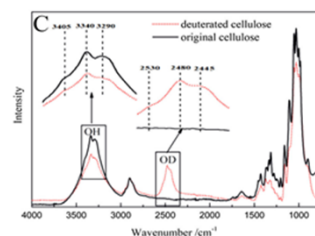
## Significance and Impact

Substitution of hydrogen ( $^1\text{H}$ ) by deuterium ( $^2\text{H}$ ) enables analytical and imaging techniques, including NMR, FTIR, SANS, WANS, and neutron diffraction, to reveal details of solvent interactions with cellulose

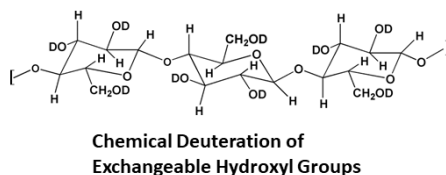
## Research Details

- We summarized results from our published work, including both biological synthesis and chemical exchangeable methods to produce deuterium-substituted cellulose for specific experiments such as neutron scattering.
- Literature review was carried out to provide an overview of reported techniques and scientific applications.

FTIR of Chemically Deuterated Cotton

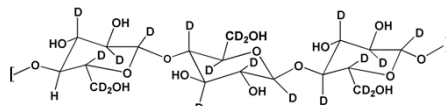
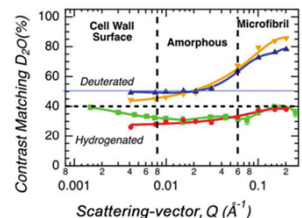


Deuterium Labelling of Cellulose



Chemical Deuteration of Exchangeable Hydroxyl Groups

SANS of Biologically Deuterated Switchgrass



Biological Deuteration of Non-Exchangeable Alkyl Groups

Deuteration of cellulose by biological and chemical methods enables elucidation of its chemical and molecular structural associations and changes.

Reference: Song et al. (2022) *Cellulose* 29:4269-4286.  
[doi.org/10.1007/s10570-022-04551-4](https://doi.org/10.1007/s10570-022-04551-4)

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Visualization of Solvent Disruption  
of Biomass and Biomembrane Structures in the  
Production of Advanced Biofuels and Bioproducts