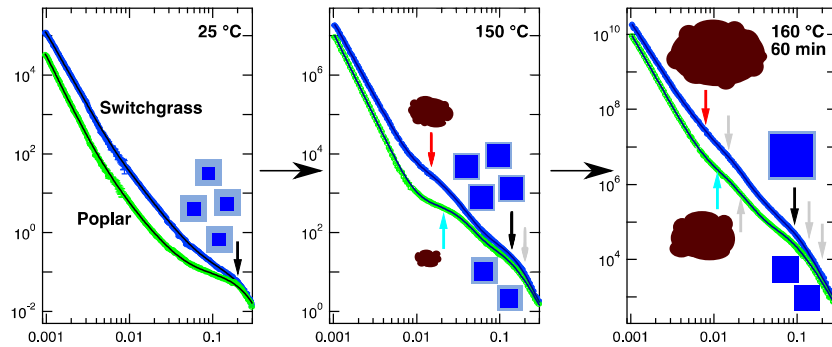


Understanding multiscale structural changes during dilute acid pretreatment of switchgrass and poplar



Small-angle neutron scattering (SANS) of *switchgrass* and *hybrid Poplar* at different stages of dilute acid pretreatment. Cellulose microfibrils and lignin aggregates are represented by blue squares and brown shapes, respectively.

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Scientific Achievement

Structural changes that occur in grasses and woody plants during dilute acid pretreatment were studied using SANS. Larger lignin aggregates and greater cellulose microfibril coalescence in switchgrass did not correlate with enzyme inhibition, as sugar yields were higher compared to hybrid poplar. However, the surface characteristics of the pretreated materials indicate a greater increase in surface area accessible to enzymes in switchgrass.

Significance and Impact

Cellulose accessibility is the decisive factor in increasing glucose yields, while cellulose crystallinity and lignin aggregation play lesser roles. These insights can be used to improve and optimize current biomass deconstruction for biofuel production

Research Details

- Samples of switchgrass and hybrid poplar were extracted at different stages of the pretreatment process.
- Samples were soaked in D₂O solvent to increase contrast to be observed by neutrons.
- This study employed SANS; X-ray diffraction; chemical composition and enzymatic digestion.



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