Neutron Technologies for Bioenergy Research

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DOE/Office of Science/Biological & Environmental Research

Background

- Neutron scattering is a powerful technique that can be used to probe the structures and dynamics of complex systems. It can provide a fundamental understanding of the processes involved in the production of biofuels from lignocellulosic biomass.

Outcome

- A review article summarizes the variety of neutron scattering technologies which are available to elucidate both the organization and deconstruction of this complex composite material and the associations and morphology of the component polymers and the enzymes acting on them.

Advantages of neutrons in bioenergy

- Multiple length scales ranging from nm to mm and time scales from μs to ps.
- Uniquely sensitive to hydrogen (and deuterium), a key effector in many biological, chemical, and industrial processes for producing biofuels.
- Adjustable deuteration to alter scattering levels,
- Little direct radiation damage,
- In situ reaction cells due to ns are highly penetrating, making it possible to employ sample environments that are not suitable for other techniques.
- The true power of neutron scattering is realized when it is combined with computer simulation and modeling and contrast variation techniques enabled through selective deuterium labeling.
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