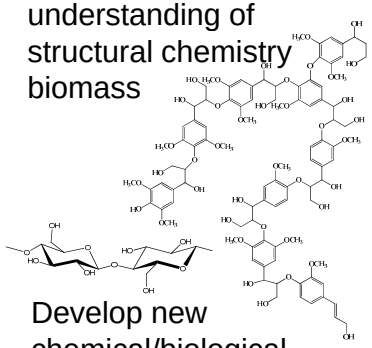
PLANT BIOPOLYMER BASED BIOMATERIAL AND BIOFUEL RESEARCH

Current research projects - Professor Art Ragauskas

Georgia Tech School of Chemistry and Biochemistry; Institute of Paper Science and Technology

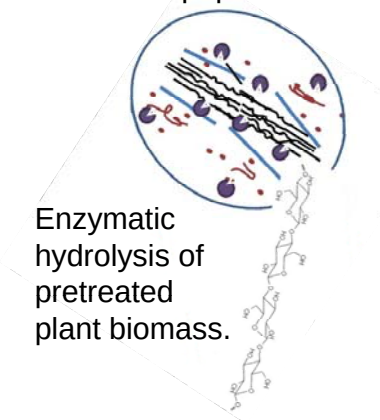
Feedstock ⇒ Pretreatment ⇒ Biofuels

Develop fundamental understanding of structural chemistry biomass



Develop new chemical/biological pretreatments for biofuels.

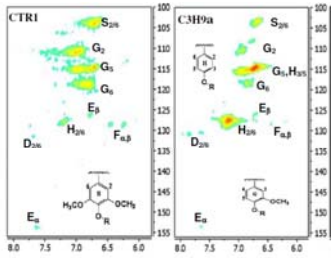
Pretreated poplar



Enzymatic hydrolysis of pretreated plant biomass.

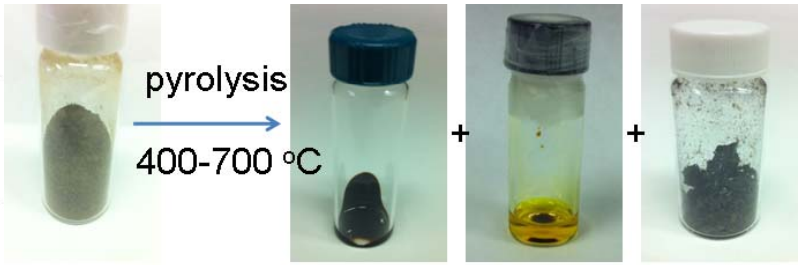
Thermochemical conversion; PYROLYSIS

Biomass & cellulose:
Understanding chemical transformations during pyrolysis.
Ultimate goals:
- reduction of reaction severity
- stabilization of pyrolysis oils

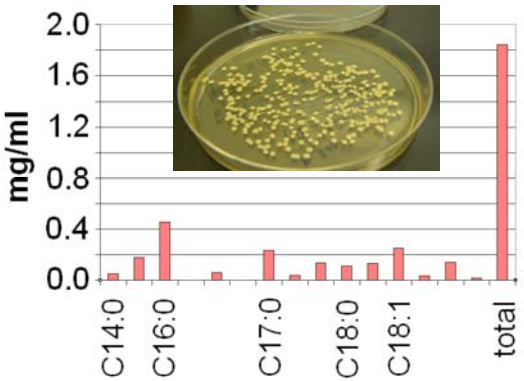


HSQC of Lignin

Lignin:



Bioconversion; FERMENTATION



Conversion of lignin and its model compounds into lipids then to biodiesel by fermentation with Rhodococci.

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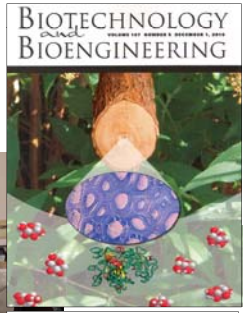
Journal covers (2010-2011):



Georgia Tech CHEMISTRY & BIOCHEMISTRY
Institute of Paper Science and Technology

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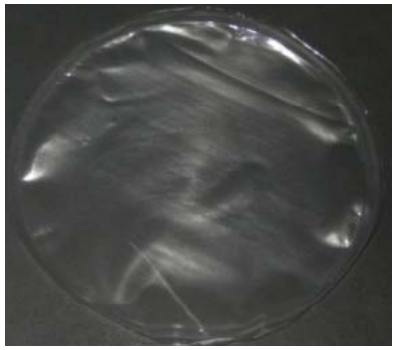
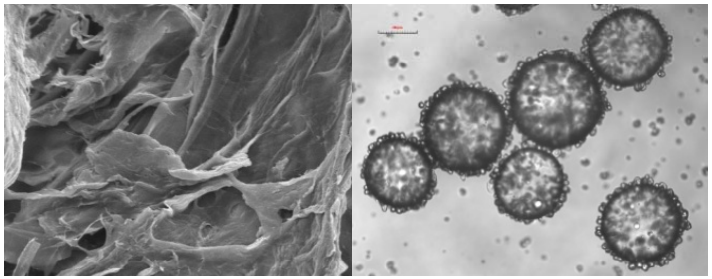
Biomaterials

Utilization of cellulosic fibers, beads, and nanowhiskers for
- chromatographic material
- novel hydrogels
- superabsorbents
- water soluble biopolymers

through their chemical modifications.

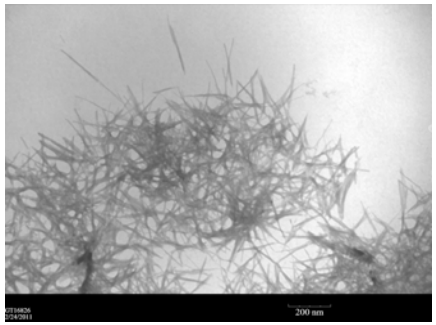


PLA-PBS-MCC nanocomposite film



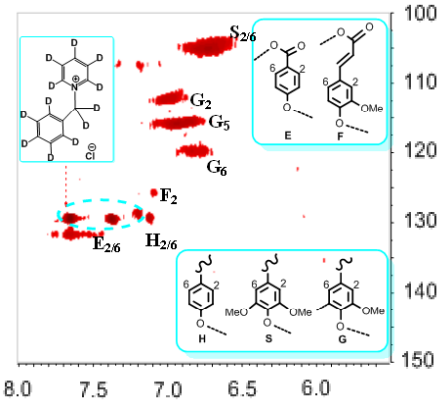
SEM images of cellulose fibers and nanobeads

Preparation of cellulose nano whiskers reinforced lignin-based rigid polyurethane foams

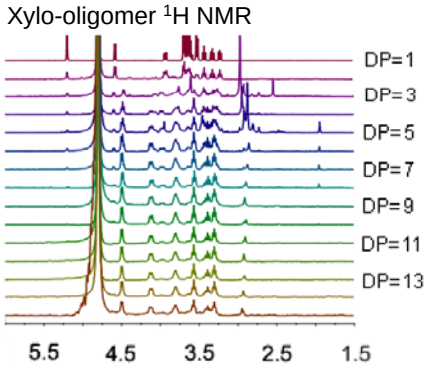


Development of bio-based nanocomposites reinforced with microcrystalline cellulose (MCC)

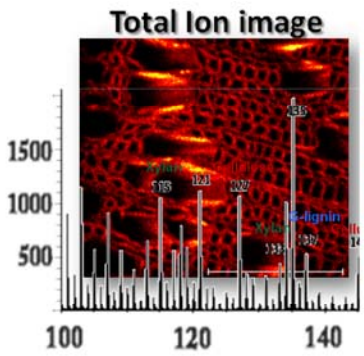
Analysis & Development



Ionic liquids for direct biomass dissolution and NMR analysis to understand biomass recalcitrance.



Advanced NMR techniques to study the chemistry, dynamics and mechanism of deconstruction of lignocellulose to form biofuels.



ToF-SIMS spectrum - Sectioned surface of Poplar cellulose

Using imaging mass spectrometry (IMS) - ToF-SIMS & MALDI-MS-t o understand cell wall surface chemistry before and after treatment compared to its bulk chemistry.

"Integrated Biorefinery"

Integrates biomass productivity and processing to obtain a range of fuels, power, and chemicals while utilizing all components of biomass to maximize sustainability and economic pay off.

Seeks to develop a **"carbohydrate-lignin economy"** that **will become the primary resource for biobased fuels, chemicals and materials**.

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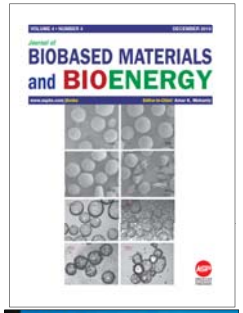

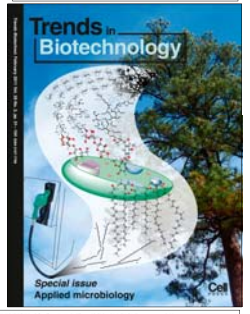

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