

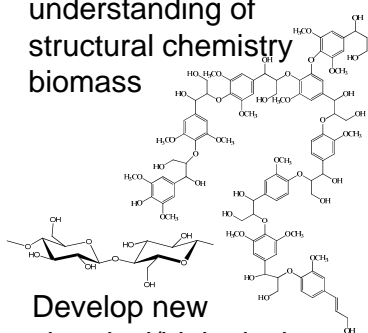
PLANT BIOPOLYMER BASED BIOMATERIAL AND BIOFUEL RESEARCH

Current research projects - Professor Art Ragauskas
Georgia Tech School of Chemistry and Biochemistry; Institute of Paper Science and Technology

Feedstock → Pretreatment → Biofuels



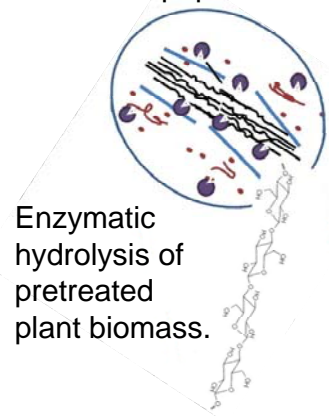
Develop fundamental understanding of structural chemistry biomass



Develop new chemical/biological pretreatments for biofuels.



Pretreated poplar



Enzymatic hydrolysis of pretreated plant biomass.

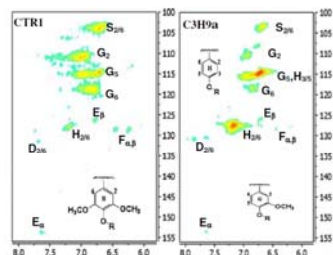
Thermochemical conversion; PYROLYSIS

Biomass & cellulose:

Understanding chemical transformations during pyrolysis.

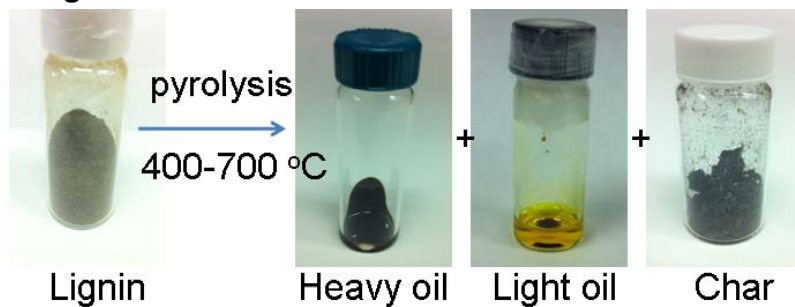
Ultimate goals:

- reduction of reaction severity
- stabilization of pyrolysis oils



HSQC of Lignin

Lignin:



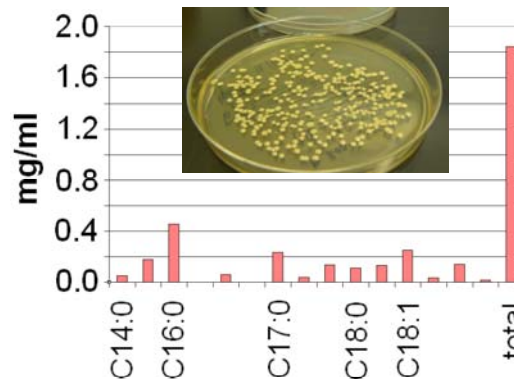
Lignin

Heavy oil

Light oil

Char

Bioconversion; FERMENTATION



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

RAGAUSKAS GROUP:



Journal covers
(2010-2011):

BIOTECHNOLOGY
and
BIOENGINEERING



Green Chemistry



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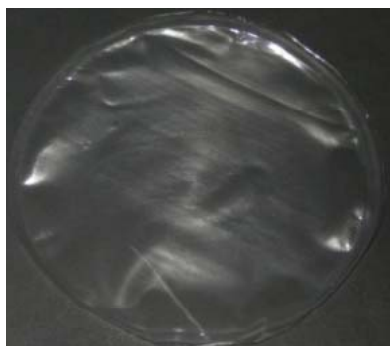
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Biomaterials

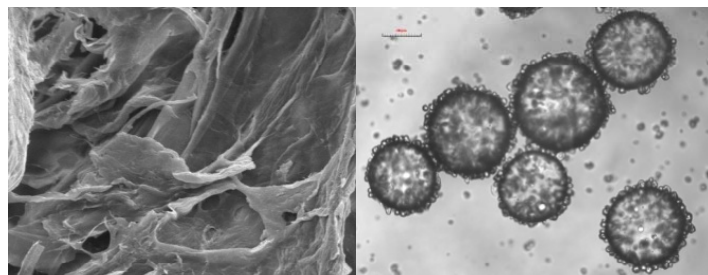
Utilization of cellulosic fibers, beads, and nanowhiskers for

- chromatographic material
- novel hydrogels
- superabsorbents
- water soluble biopolymers

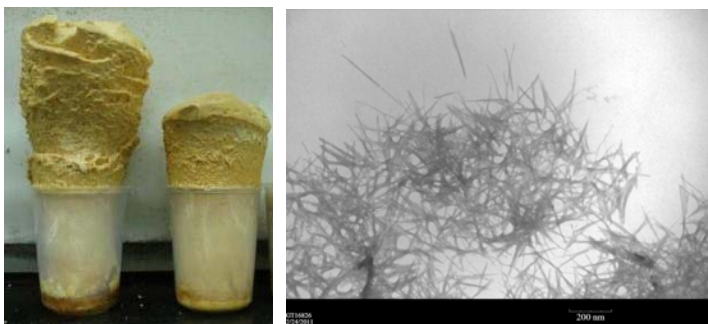
through their chemical modifications.



PLA-PBS-MCC nanocomposite film



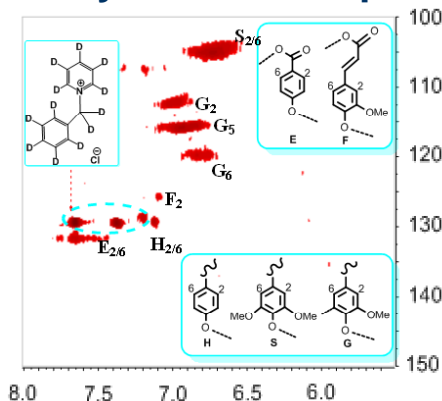
SEM images of cellulose fibers and nanobeads



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

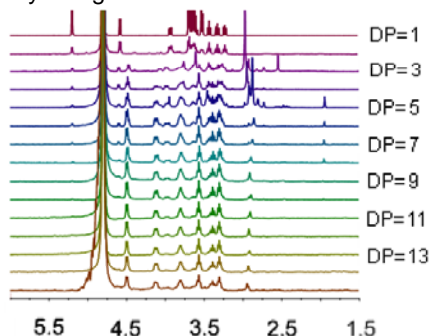
Development of bio-based nanocomposites reinforced with microcrystalline cellulose (MCC)

Analysis & Development



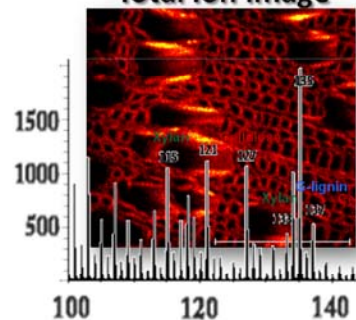
Ionic liquids for direct biomass dissolution and NMR analysis to understand biomass recalcitrance.

Xylo-oligomer ¹H NMR



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

Total Ion image



ToF-SIMS spectrum -

Sectioned surface of Poplar cellulose

Using imaging mass spectrometry (IMS) - ToF-SIMS & MALDI-MS to 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.

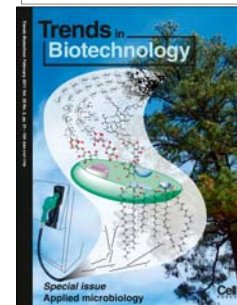
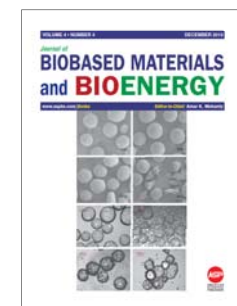
Seeks to develop a “carbohydrate-lignin economy” that will become the primary resource for biobased fuels, chemicals and materials.

RAGAUSKAS GROUP:



Journal covers

(2010-2011):



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