# 'Advanced Biomass Characterization'
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PROGRAM DESCRIPTION

- Characterization of plant cell walls, particularly lignin, is crucial for biofuel and biomaterial research.
- Development of novel ionic liquid system for biomass dissolution.
- Direct dissolution and NMR analysis of the whole plant cell walls via perdeuterated ionic liquids.
- Determination of inter-unit lignin bonding, lignin content, H:S:G lignin ratios; hemicelluloses, LCC
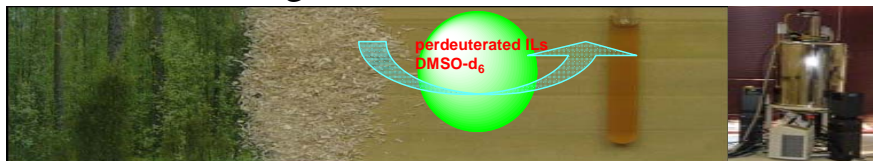
Direct dissolution and NMR analysis of biomass

TECHNICAL DETAILS

- Pyridinium-based ionic liquid [Hpyr]Cl prove optimum for IL/DMSO-d_6 bi-solvent system for biomass dissolution.
- Perdeuterated ionic liquid [Hpyr]Cl-d_6 was simply prepared for NMR characterization of the plant cell walls.
- Both ball-milled and Wiley milled (20 mesh) biomass samples can be dissolved in [Hpyr]Cl-d6/DMSO-d_6 (solubilities up to 100mg/g).
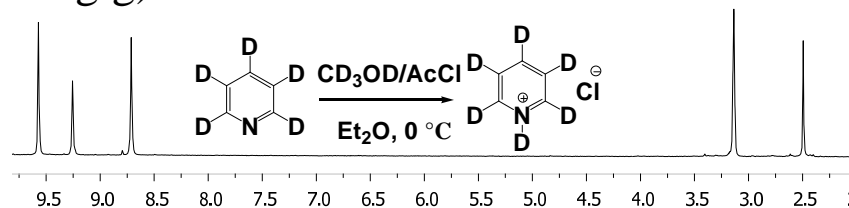

Fig 2. Preparation and 1H NMR spectra of [Hpyr]Cl-d_6

PAYOFF

- 13C NMR spectra of biomass show detailed lignin structures and be used to determine H/S/G lignin ratio.
- 2D HSQC spectra of biomass give H, S, G lignin cross signals and other lignin side-chain signals.
- 1H NMR spectra can be used to determine lignin content via Linear Extrapolation method.
- Facile characterization of whole cell biomass
- Improved processing of biomass to biofuels

KEY ACCOMPLISHMENTS

- Develop novel perdeuterated system for direct dissolution and NMR characterization of biomass
- 13C NMR and 2D HSQC spectra of biomass reveal detailed lignin structure.
- 1H and 13C NMR analysis of biomass provide fast and efficient determination of lignin content and H/S/G lignin ratio.
- Identtify key recalcitrance components of biomass

Professor AJ Ragauskas, Supervisor