ABSTRACT SYMPOSIUM NAME: Valorization of Renewable Resources & Residuals into New Materials & Multiphase Systems-Oral

ABSTRACT SYMPOSIUM PROGRAM AREA NAME: CELL

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TITLE: Synthesis, properties and carbonization of different types of ligneous aerogels

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ABSTRACT BODY:

Abstract: Following our previous works on hydro- and aerogels from different lignins cross-linked with oligo(alkylene glycol)-α,ω-diglycidyl ethers and on the preparation of phenol-formaldehyde (PF) adhesives of high lignin content, this paper reports the preparation of mechanically stable, monolithic aerogels from ligneous precursor materials that have been brought to gelation by either step-reaction or chain reaction polymerization.

Dialysis and subsequent thermo-induced gelation of ligneous resole resin pre-condensates (LPF, 40% replacement of phenol by lignin, v = 1000 mPa s) in ethylene glycol afforded freestanding, homogeneous gels. Incremental replacement of ethylene glycol by ethanol and $scCO_2$ drying produced aerogels that suffered from comparatively little shrinkage and perfectly maintained the initial cylindrical shape even at bulk densities as low as 25 mg cm^{-3}. Scanning electron microscopy, nitrogen sorption at 77 K and thermoporosimetry using *o*-xylene as probe solvent revealed a largely homogenous internal mesoporous morphology featuring accessible specific surface areas as high as 527 m^2 g^{-1}. Chain reaction polymerization of consecutively *Fenton*-oxidized and per-methacrylated lignin in toluene using a suitable radical source turned out to be an efficient means to produce entirely lignin-based aerogels (apparent density 32-222 mg cm^{-3}) that had an internal surface of up to 370 m^2 g^{-1}. Carbonization at 1300°C maintained the shape of the respective aerogels and interconnectivity of pores, however at significant shrinkage.

(No Image Selected)