CARBON FIBER FROM ENGINEERED LIGNINS

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Lignin has received much recent interest towards the manufacture of value-added chemicals, fuels and materials. The focus on materials has been in the manufacture of value added products to enhance the economics of the existing pulp and emerging biorefinery industries. Most lignin product research has been directed towards the use of commercial lignins in the manufacture of carbon fiber, and also in resins where the lignin is added as a replacement for one of the active components or as a low cost extender. Particular barriers to the utilization of lignin in value added products have been caused mainly by inorganic and polysaccharide impurities and also the polydispersity of the particular lignins used.

The Center for Renewable Carbon (CRC) has embarked on a program to manufacture lignin products from both biomass and commercial lignins and has several areas of interest, which include the manufacture of carbon fiber, carbon nanofibers, lignin polymer fiber, carbon foams, graphitic materials and carbon-carbon composites. The products are expected to find applications in markets that utilize structural, insulating, conductive, separation, energy storage, filtration and light-weighting materials.

The manufacture of carbon fiber is a complex process, and is especially so with the use of lignin as precursor, since the purity and properties of various lignins are diverse. The presentation will describe work performed at CRC towards the manufacture of low-cost carbon fiber from lignin. A brief review of prior lignin carbon fiber work, carbon fiber processing and economics will be given, followed by presentation of earlier data gathered from work previously done using thermally engineered lignins by the presenter. More recent work on the purification and successive solvent extraction of technical kraft (Figure 1) and organosolv lignins, and also the manufacture of high purity lignins using a CRC organosolv process will then be presented..

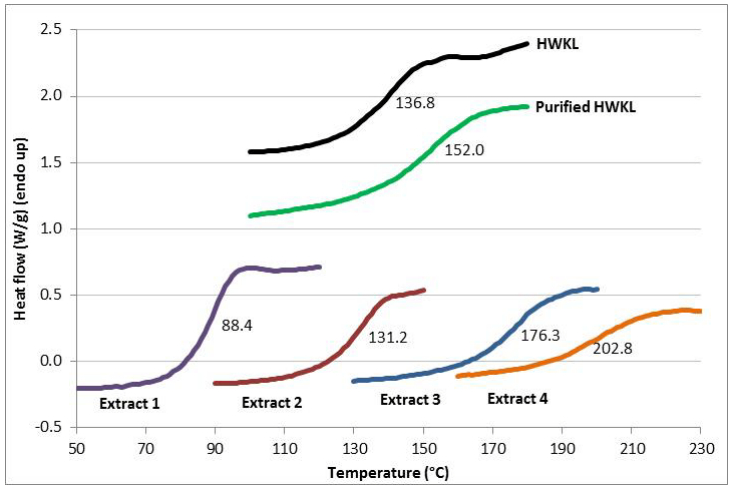

Figure 1: Differences in glass transition for a hardwood kraft lignin purified and sequentially solvent extracted.