

Lignin Butyration for Improved Miscibility in PAN/DMSO for Carbon Precursor Fiber

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Lignin is an organic polymer that aids in the rigidity of the cell walls of plants. As a part of the Kraft pulping process in paper manufacturing, an estimated 50 million tons of lignin are produced each year as waste. This lignin is often burned to produce heat or electricity at the paper mills. Using the lignin to make precursor fiber for carbon fiber could decrease the cost of carbon fiber and create an added revenue stream for paper manufacturers. This can be achieved by adding lignin to polyacrylonitrile (PAN) and dimethyl sulfoxide (DMSO) to make a dope. At loadings of 30% lignin to PAN and higher, phase separation can be observed. After performing a butyration process on the lignin using butyric anhydride and 1-methylimidazole, the B-lignin has greater miscibility in PAN/ DMSO. The B-lignin was mixed at loadings up to 50% to PAN and 18% total solids to DMSO to make a dope for wet spinning. The dope was extruded through a 500-hole spinneret, washed, stretched, and taken up onto a spool. This process was as stable as wet spinning with 100% PAN in DMSO and could lead to cheaper production of carbon fiber.