

## **RAPID CHARACTERIZATION AND DETERMINATION OF WOOD CHEMISTRY AND CRYSTALLINITY INDEX OF LOBLOLLY PINE**

*Kelvin Smith, Brian K. Via, Wei Jiang, Lori Eckhardt*

Auburn University  
Biosystems Engineering and School of Forestry and Wildlife Sciences  
520 Devall Drive  
Auburn, Alabama, United States

[KHS0003@auburn.edu](mailto:KHS0003@auburn.edu) (K. Smith) & [bkv0003@auburn.edu](mailto:bkv0003@auburn.edu) (B. Via)

Rapid characterization of wood chemistry and crystallinity index for 200 loblolly pine trees was performed with near infrared spectroscopy (NIR) and Fourier transform infrared reflectance spectroscopy (FT-IR) spectroscopy, respectively. Loblolly pine is the most common type of southern pine in the southeastern region of the United States and was thus utilized for this study. NIR spectroscopy coupled with multivariate modeling was employed to measure the percent chemical composition for each of the 200 samples' for 14 families including lignin, cellulose, hemicellulose and extractives. The distribution metrics such as the mean and standard deviation for lignin, cellulose, hemicellulose and extractives was similar to that reported in the literature and all followed a normal distribution. The ratio of absorbance for crystalline ( $1428\text{ cm}^{-1}$ ) and amorphous cellulose ( $898\text{ cm}^{-1}$ ) associated wavelengths was utilized to infer the crystallinity index. For application, it is suggested that trees from families of low lignin, high cellulose, and high crystallinity index could be partitioned for high value end products while higher lignin trees/families could be utilized for bioenergy feedstock. Future work will consist of validating the NIR models by performing wet chemistry on a subsample of the population in this study. Additionally, funds will be sought to validate the crystallinity index with the more conventional x-ray diffraction method.