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U.S. Department of Agriculture **Accomplishments Report AD-421** U.S. Dept. of Agriculture, State Agricultural Experiment Stations and Other Institutions			Date (Month, Day, Year) 03/22/2012
1. Accession 0222407	Agency Identification No. 2. SAES 3. LA.B	5. Work Unit/Project No. **LAB04045**	6. Status **Annual Report**

7. Title

Application of Nirvana to Wood Utilization

12. Investigator Name(s) (Last Name and Initials)

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20. Termination Date 04/30/2015	40. Period Covered (mo/da/year): 01/01/2011 TO 12/31/2011

Outputs:

The information gathered from this work has been disseminated in conference presentations and proceedings, as well as submitted to peer-reviewed research journals. This had led to further discussions with peer researchers leading to parallel studies with this research.

Outcomes/Impacts:

Two separate spectroscopic studies were undertaken with emphasis on microfibril angle (MFA) and fuel value. A large near infrared study (NIR) of MFA was conducted, differing from previous studies in terms of the large scale genetic sampling of over 600 trees, producing over 3,000 MFA samples cut from individual rings of increment cores. This large data set allowed the comparisons of correlations between early wood and late wood and core wood and outer wood, as well as individual growth rings. It was observed that the models based on the smaller individual growth ring data sets (still consisting of a substantial number of samples) did not provide any improvement in predictive performance over the larger data sets. The application of specific models from specific data sets, e.g. latewood models to latewood samples, did not enhance the predictions over using one overall model for all samples. Scanning of increment cores is the commonly used method for MFA prediction from NIR data; however, individual growth rings cannot be analyzed. This study indicated that individual growth ring analysis with NIR data provides no improvement. An investigation of fuel value of longleaf pine trees has been continued using mid-IR spectroscopy with similar predictions made for both fuel value and chemical composition. The interpretation of the effect of lignin and extractives content on the fuel value was clearer to observe using the mid-IR range, with similar bands being observed in the regression coefficient plots for both the fuel value and extractives content. This provided further evidence for a relationship between extractives content and fuel value for longleaf pine. Furthermore, the samples used in the study were extracted, and the actual extracts analyzed;, the authors are unaware of any previous reported studies in which models were built from NIR or mid-IR spectra of the actual extracts. Intuitively, the models for extractives content using the extracts are based on the relative composition of the extractive types comprising the extracts. Thus by extension, it can be surmised that there is a proportional change in the extractives composition coinciding with the total amount of extractives present in the unextracted wood samples. This provides a new insight into spectroscopic studies related to extractives content.

Publications:

Eberhardt, T.L., H. Pan, L.H. Groom and C-L. So. 2011. Characterization and Partitioning of the Char Ash Collected after the Processing of Pine Wood Chips in a Pilot-Scale Gasification Unit. In Woody Biomass Utilization: Proceedings of the International Conference on Woody Biomass Utilization, Starkville, MS, August 4-5. 2009. Edited by John R. Shelly (Madison, WI. Forest Products Society), pp.33-38.

So C-L. and T.L. Eberhardt. 2011. The Prediction of Calorific Value using Infrared (IR) Spectroscopy and Multivariate Analysis. In Woody Biomass Utilization: Proceedings of the International Conference on Woody Biomass Utilization, Starkville, MS, August 4-5. 2009. Edited by John R. Shelly (Madison, WI. Forest Products Society), pp.48-51.

Participants:

C. So (PI), LSU AgCenter; T. Eberhardt, L. Groom, T. Elder and J.H. Myszewski (all cooperating USDA Forest

Service scientists).

Target Audiences:

Forest products and bioenergy industries and researchers, governmental agencies. Tree improvement researchers.

Project Modifications:

Nothing significant to report during this reporting period.

Approved (Signature)	Title	Date
Alyo A Ekuan		3-23-12