# Characterization of Hybrid Poplar Properties: Preliminary Results

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One attractive aspect of short-rotation woody crops is their versatility and potential for utilization in diverse markets. This is especially true given the dramatic advances made toward genetic control of chemical structure and cell wall organization. To fully exploit this opportunity, new approaches are needed to provide information on the fundamental chemical and material properties of the woody biomass. In this project, high-performance hybrid poplar trees (*X maximowiczii, and X trichocarpa*) with an average mean annual increment of 3.0 cm were selected from a 2-year old yield trial near Knoxville, Tennessee, United States. After isolating 1-inch discs from breast height, standard laboratory protocols were used to analyze the samples in terms of chemical composition, including cellulose, hemicellulose, lignin and ash content. In addition, the anatomical characteristics, microfibril angle, and crystallinity, and mechanical properties of the cell wall were investigated using sectioning, X-ray diffraction, and nanoindentation. Chemical composition did not vary between the different samples. Also, no significant difference in cellulose crystallinity of hybrid poplars wood was observed; however, microfibril angle (MFA) ranged from 11.5°and 16.7°, and appears to be closely related to growth rate. The average hardness and reduced elastic modulus were 0.25GPa and 8.58GPa (*X trichocarp-1*), 0.28GPa and 8.34GPa (X *P. maximowiczii*), and 0.31GPa and 12.18GPa (*X trichocarpa-2*), respectively. This preliminary work illustrates the value of this approach as greater opportunities to manipulate cell wall structure and properties becomes available.