

Thermal and Structural Analysis of Softwood Lignin from a Pressurized Hot Water Extraction Biorefinery Process and Their Modified Derivatives

Supporting data

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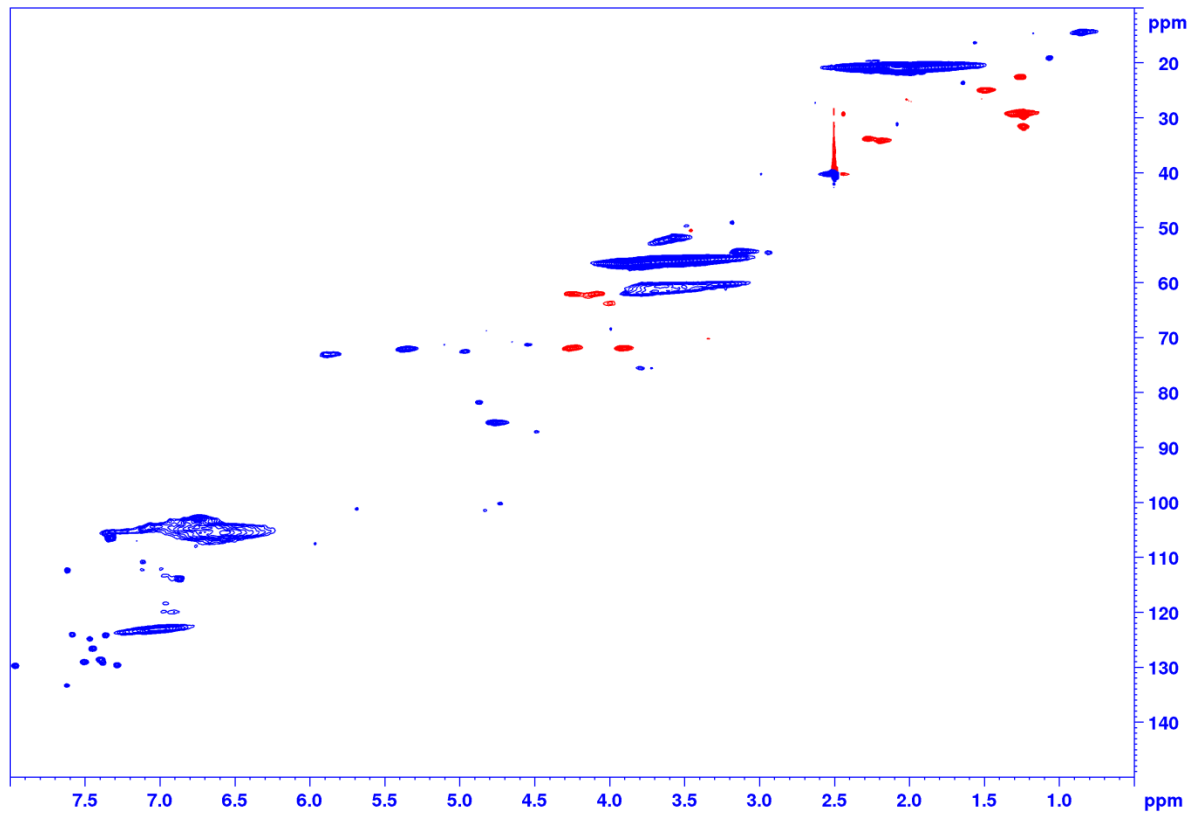


Figure S1. Multiplicity edited HSQC of acetylated birch lignin

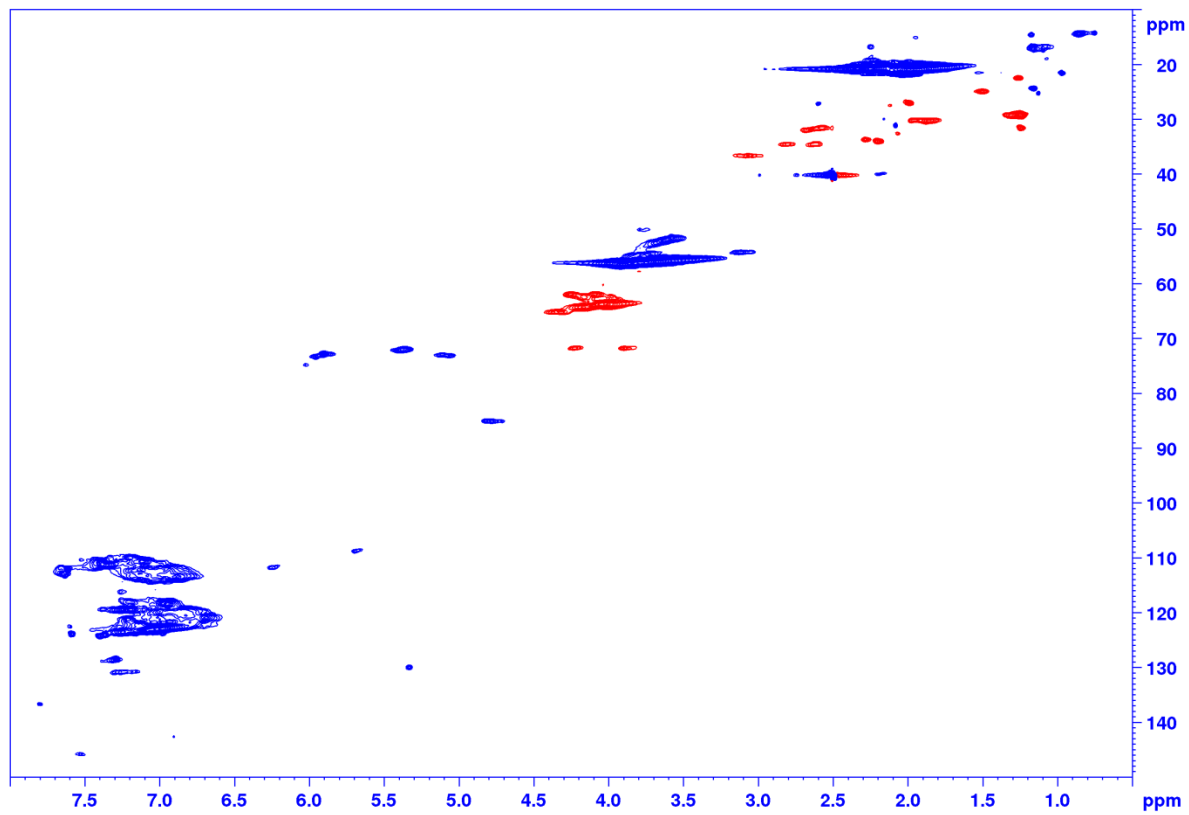


Figure S2. Multiplicity edited HSQC of acetylated pine lignin

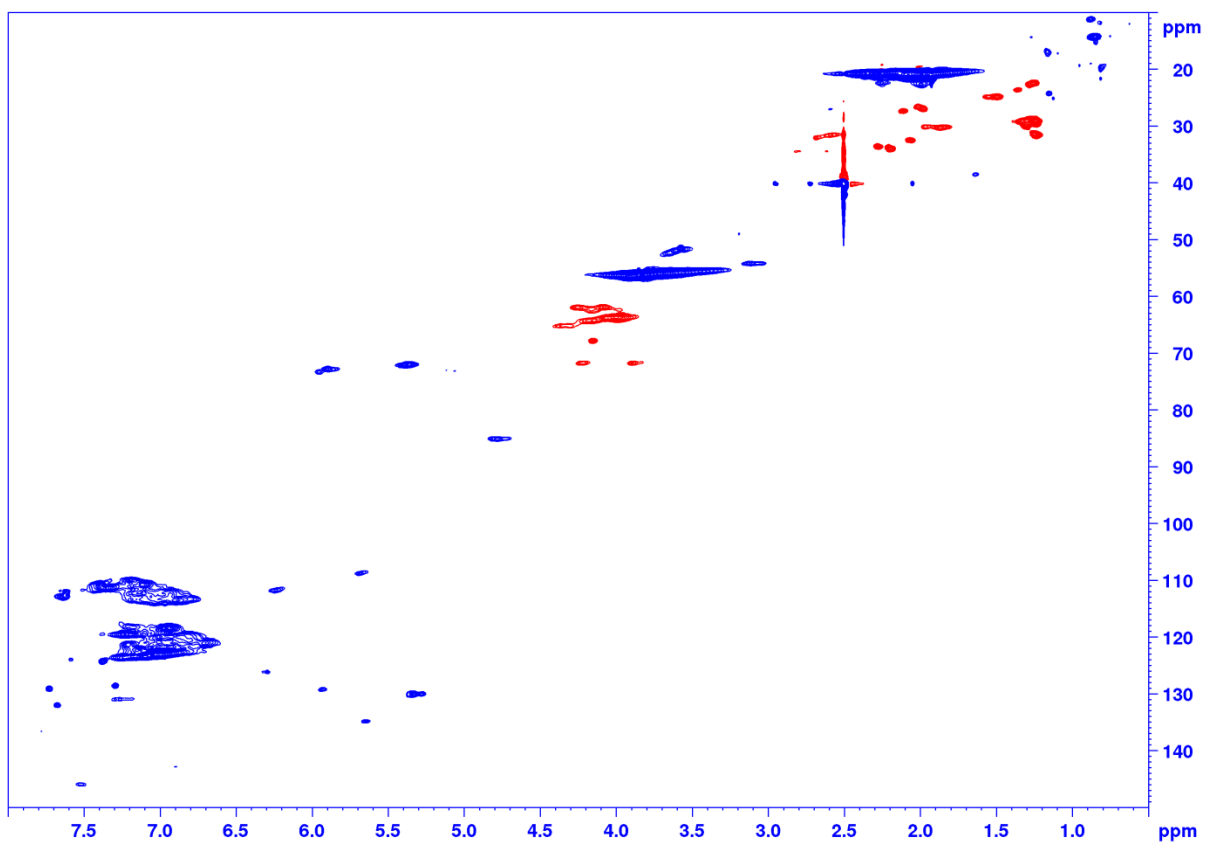


Figure S3. Multiplicity edited HSQC of acetylated spruce lignin

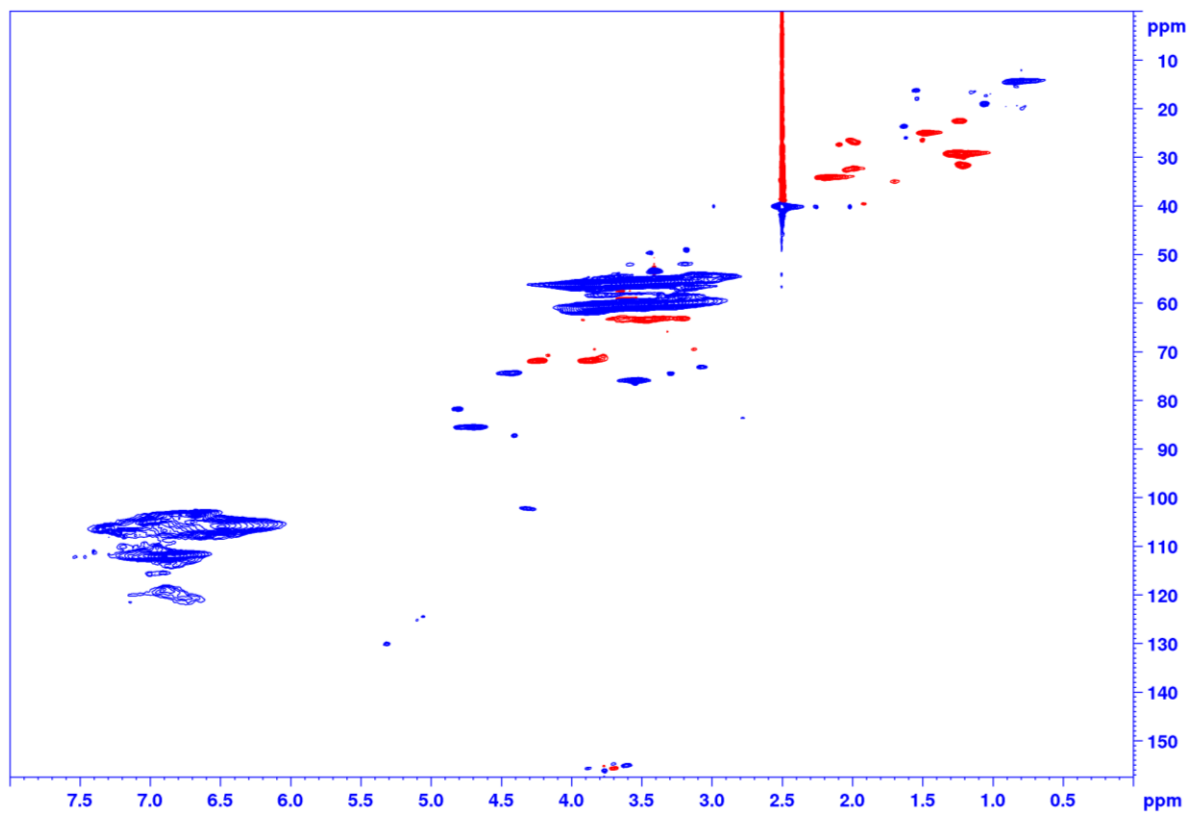


Figure S4. Multiplicity edited HSQC of partially methylated birch lignin

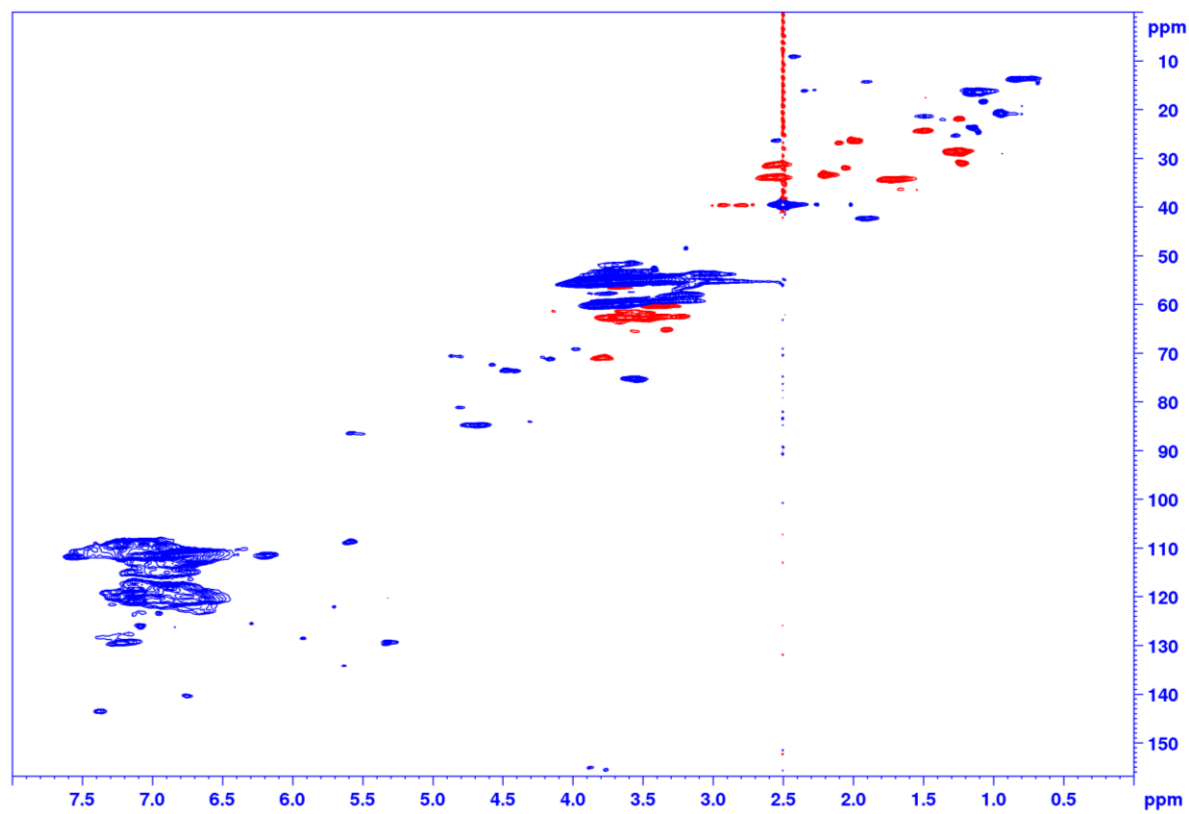


Figure S5. Multiplicity edited HSQC of partially methylated pine lignin

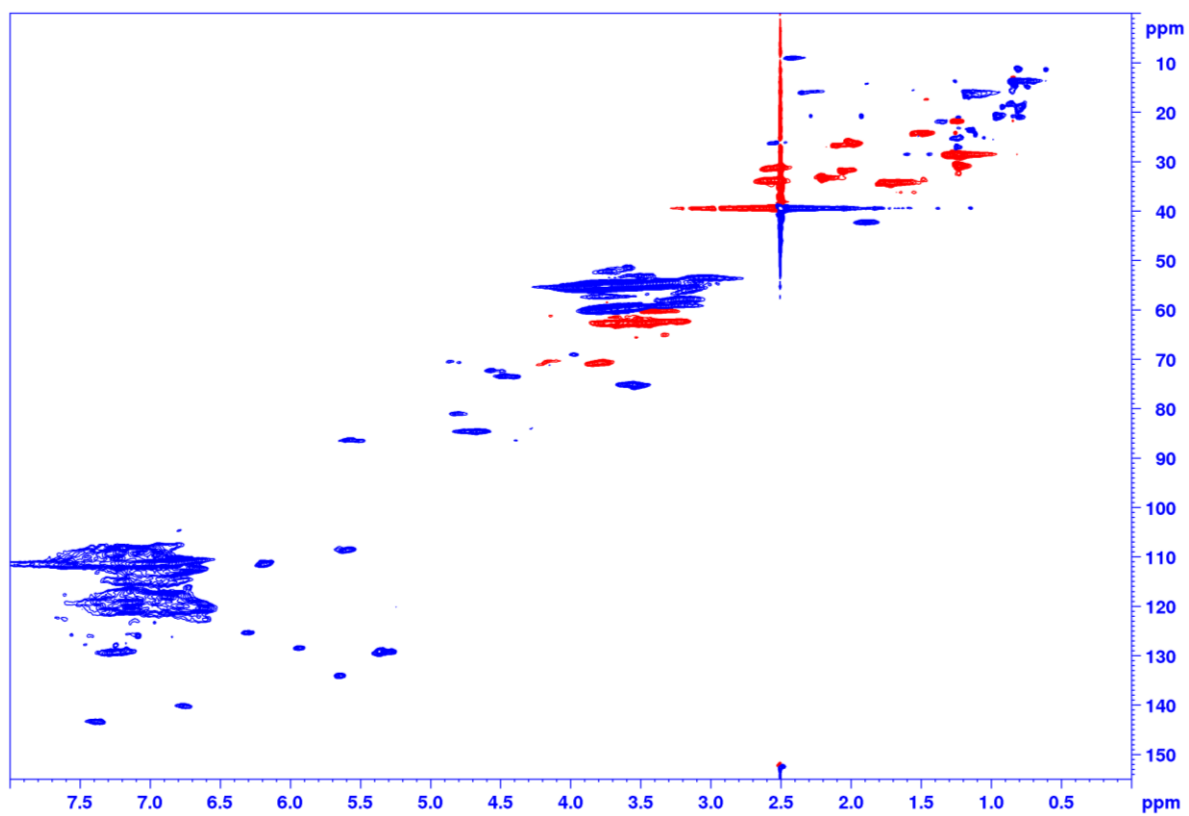


Figure S6. Multiplicity edited HSQC of partially methylated spruce lignin

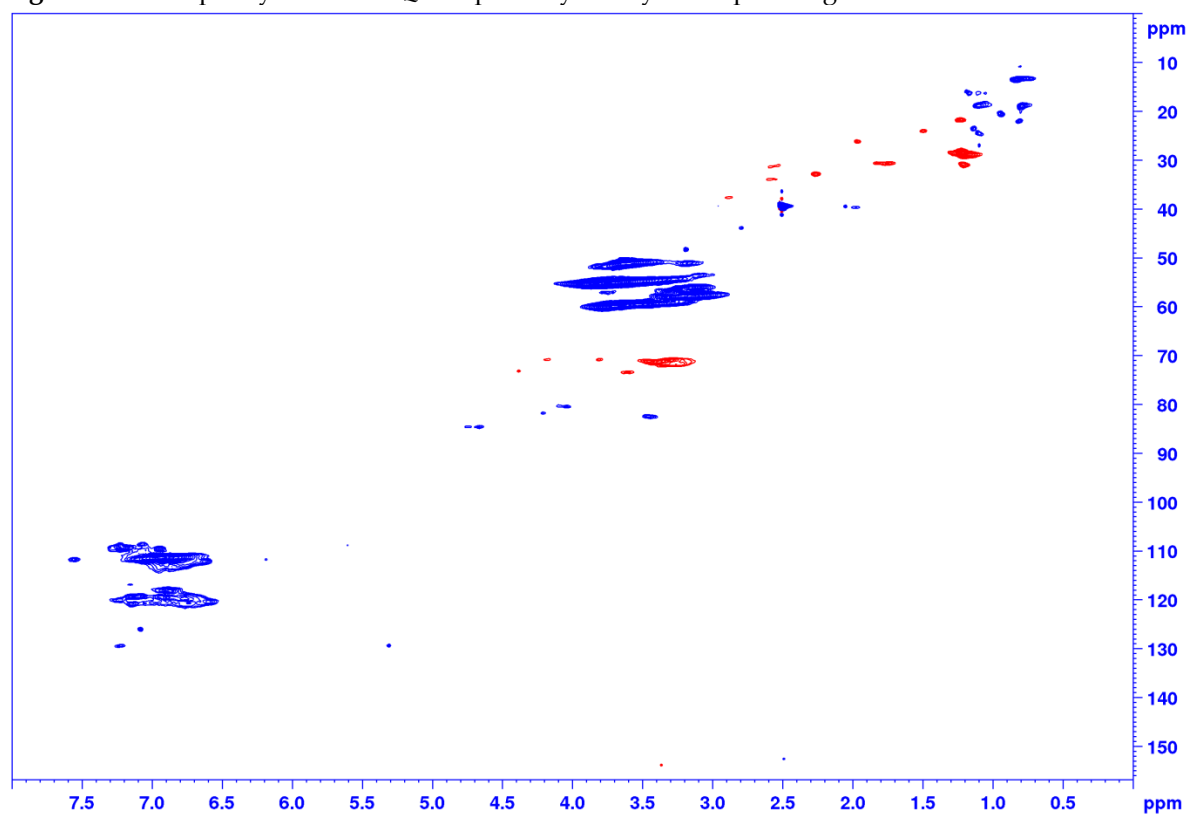


Figure S7. Multiplicity edited HSQC of fully methylated pine lignin

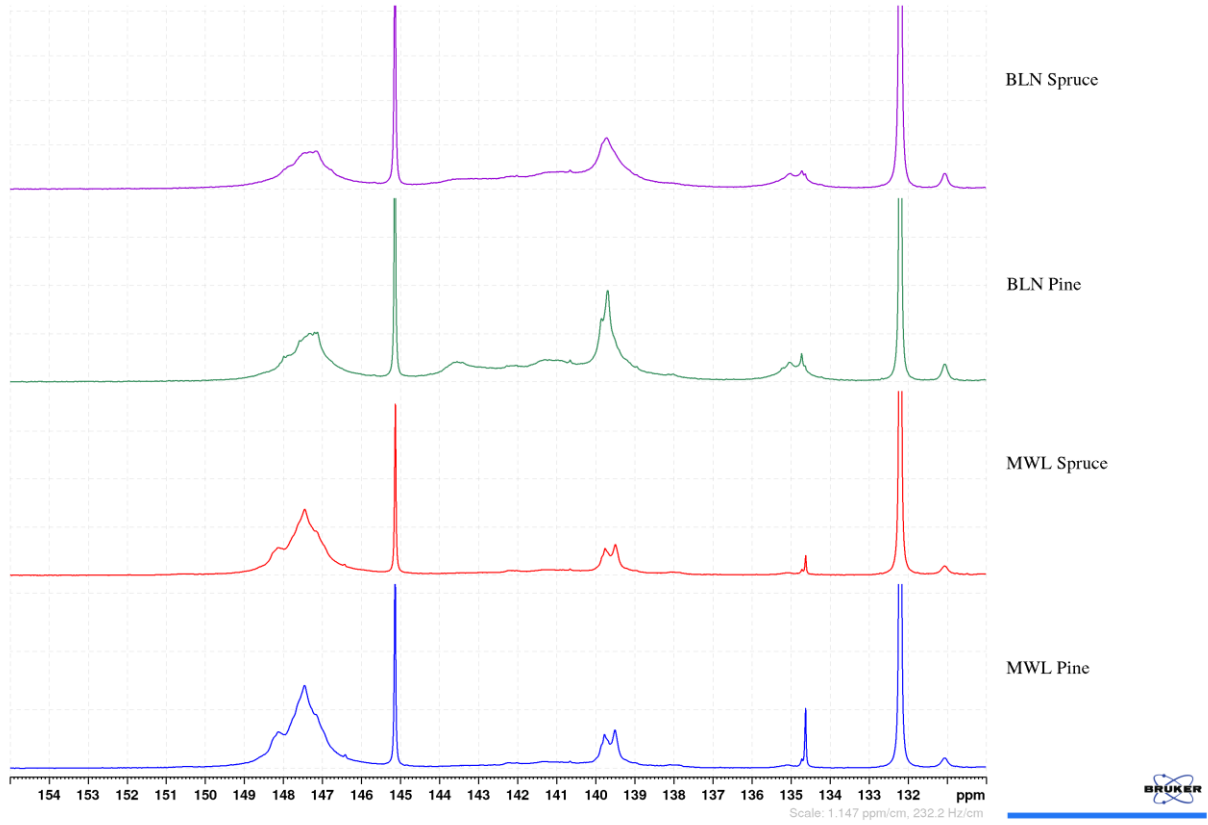


Figure S8. ^{31}P NMR of BLN spruce, BLN pine, MWL spruce and MWL pine

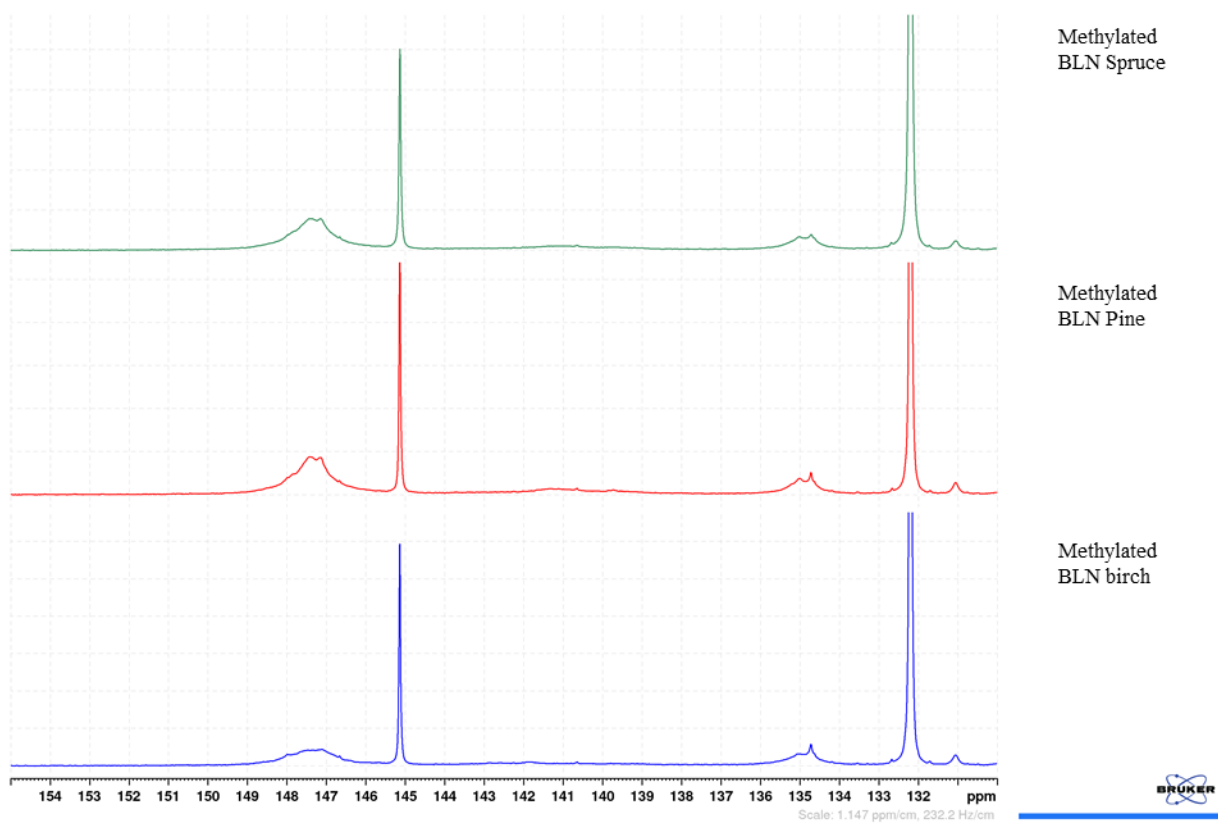


Figure S9. ^{31}P NMR of the lignin with methylated phenolic hydroxyl groups birch, spruce and pine

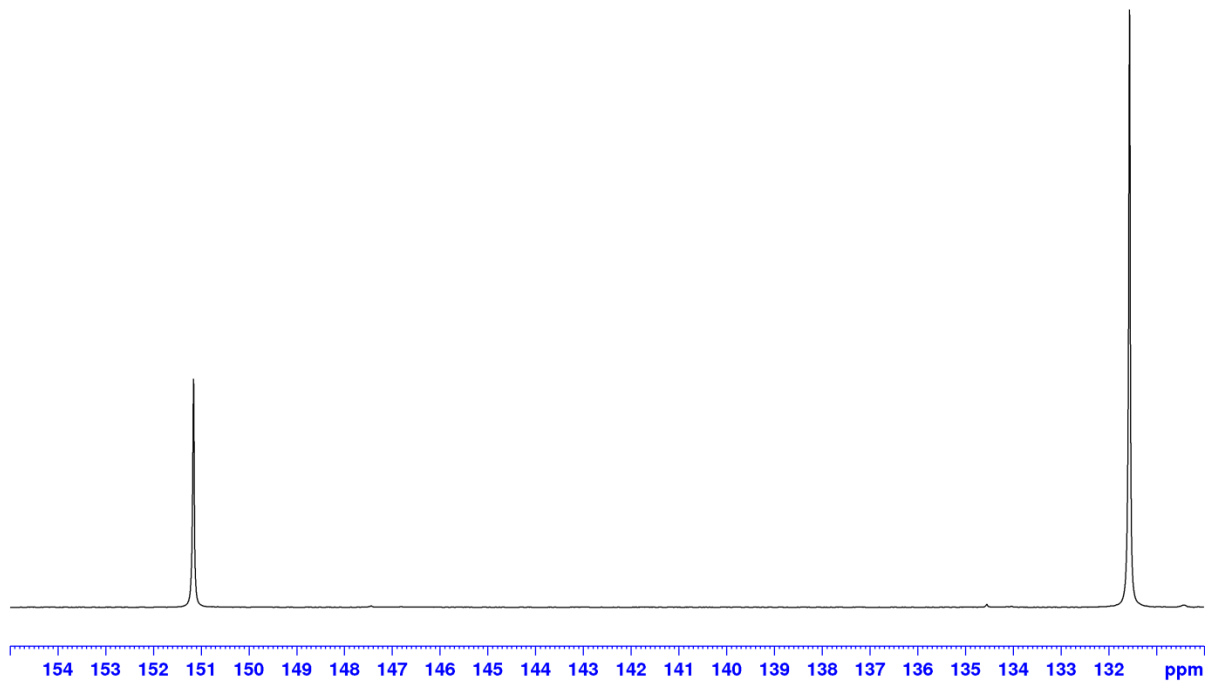


Figure S10. ^{31}P NMR of pine lignin fully methylated



Figure S11. ^{31}P NMR of the acetylated lignin birch, spruce and pine

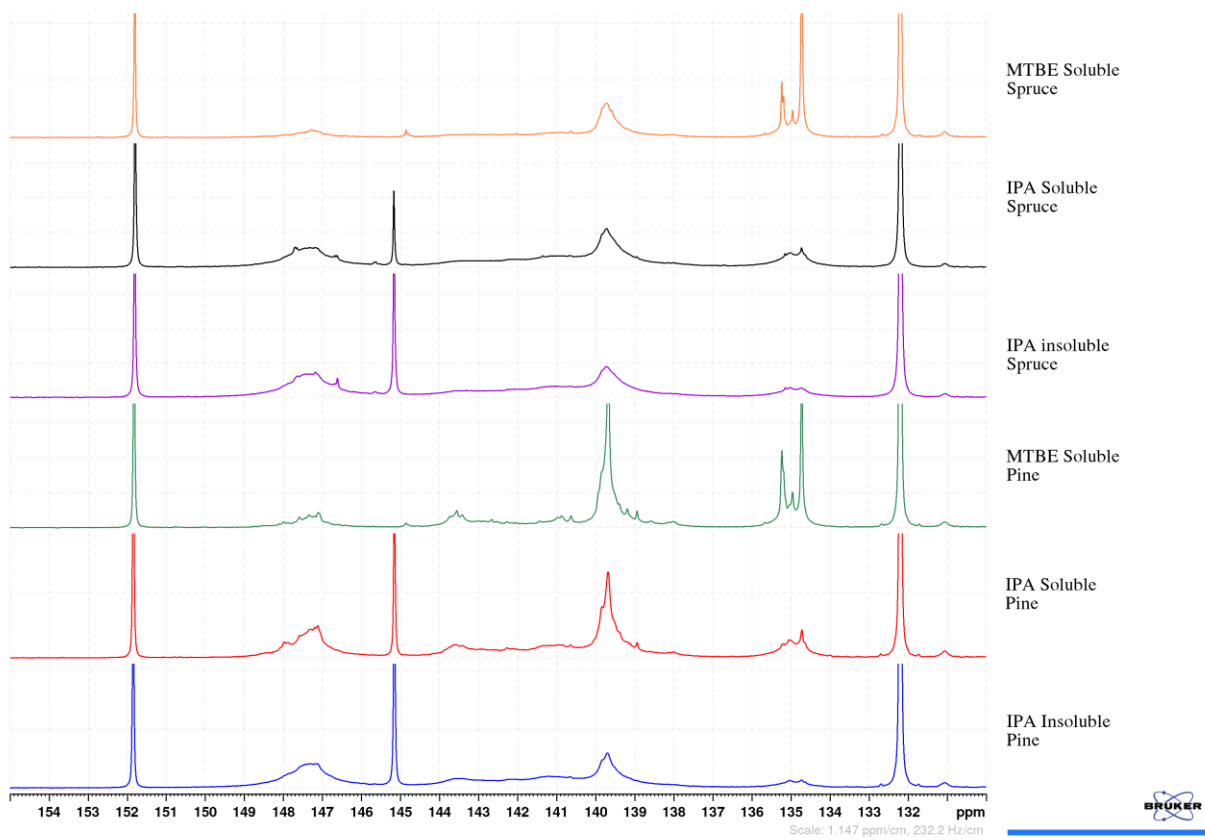


Figure S12. ^{31}P NMR of the different lignin fractions: birch, MTBE soluble spruce, IPA soluble spruce, IPA insoluble spruce, MTBE soluble pine, IPA soluble pine and IPA insoluble pine

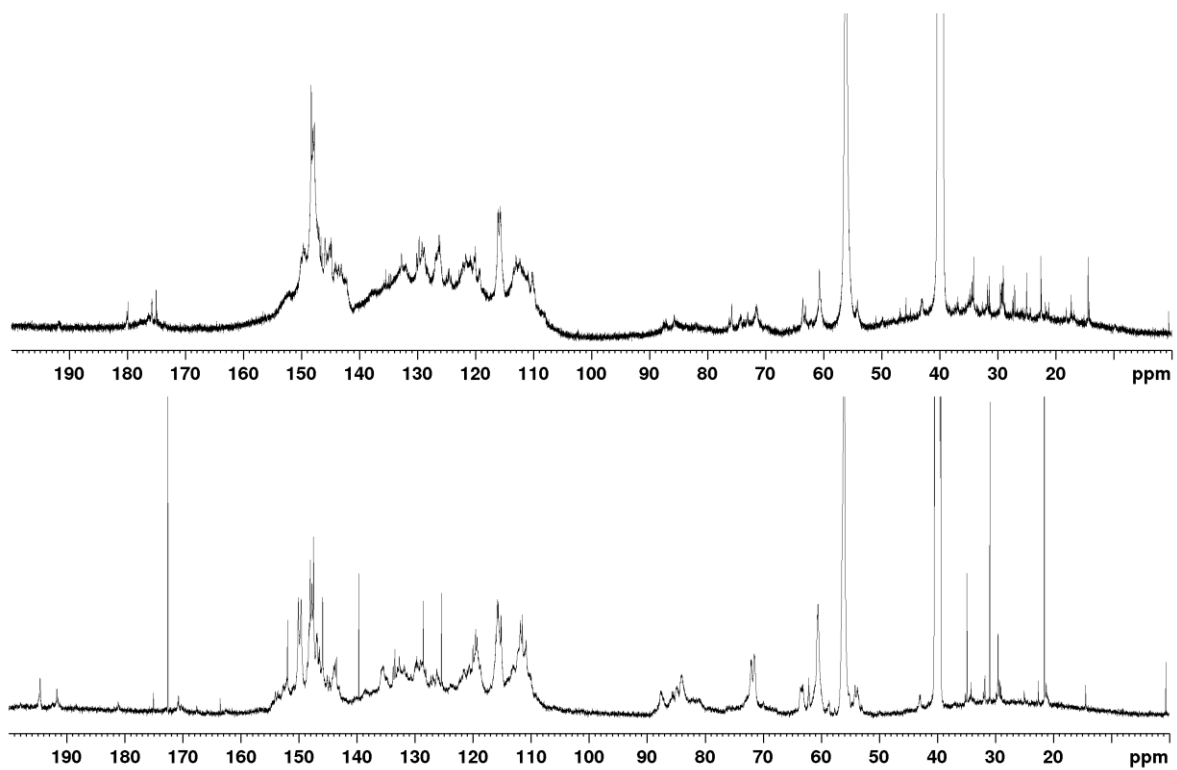


Figure S13. ^{13}C NMR of pine, BLN (top), MWL (down)

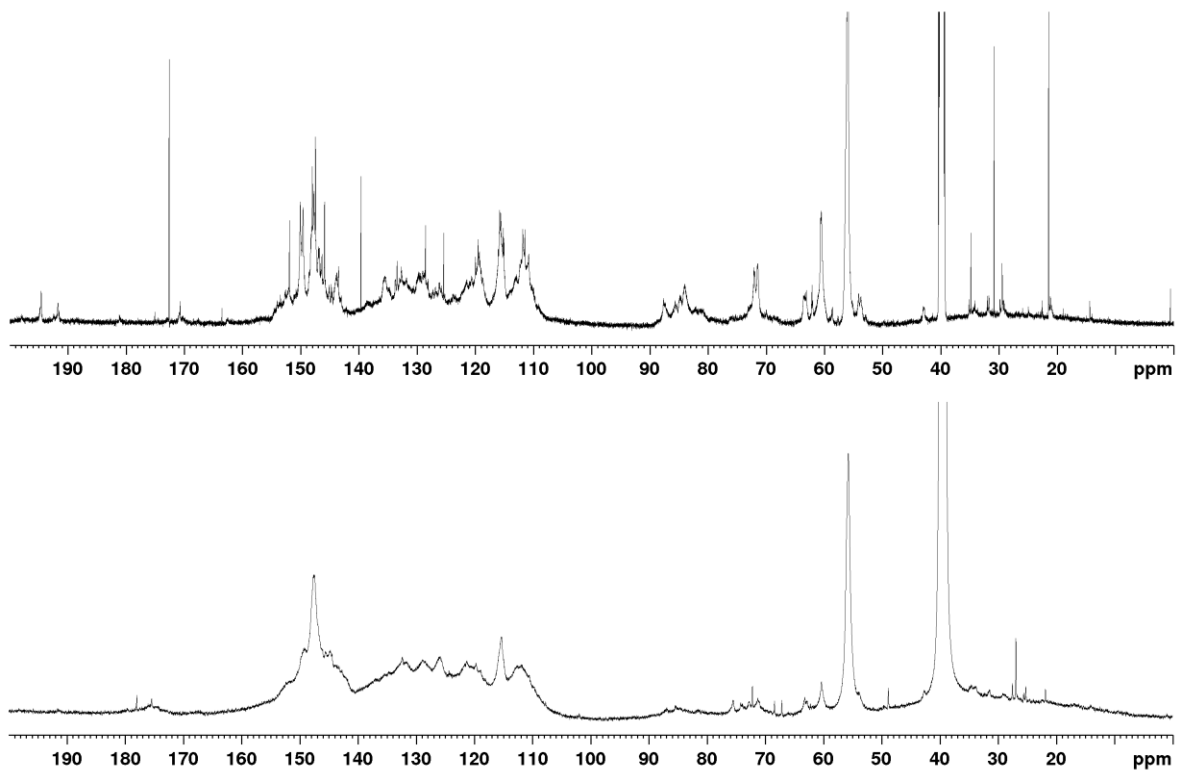


Figure S14. ^{13}C NMR of spruce, BLN (top), MWL (down)

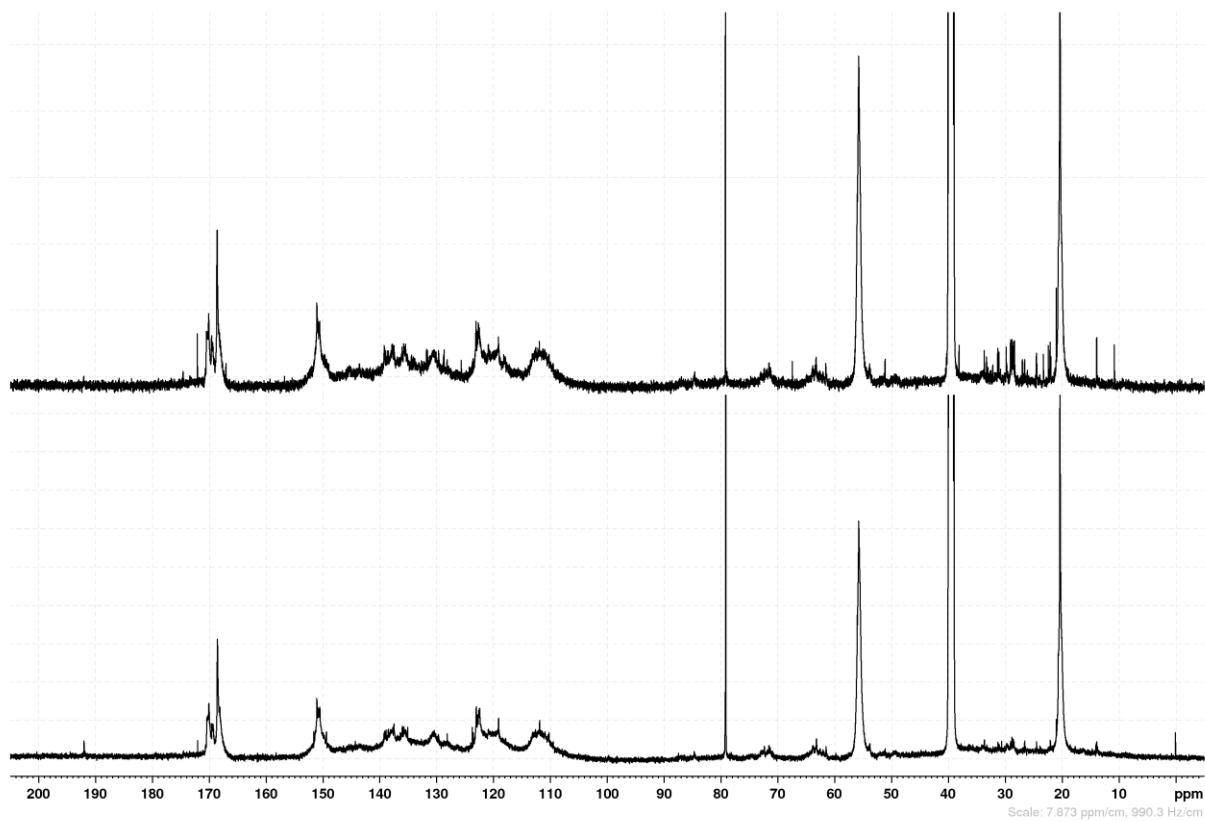


Figure S15. ¹³C NMR of acetylated BLN lignin spruce (top) and pine (down)

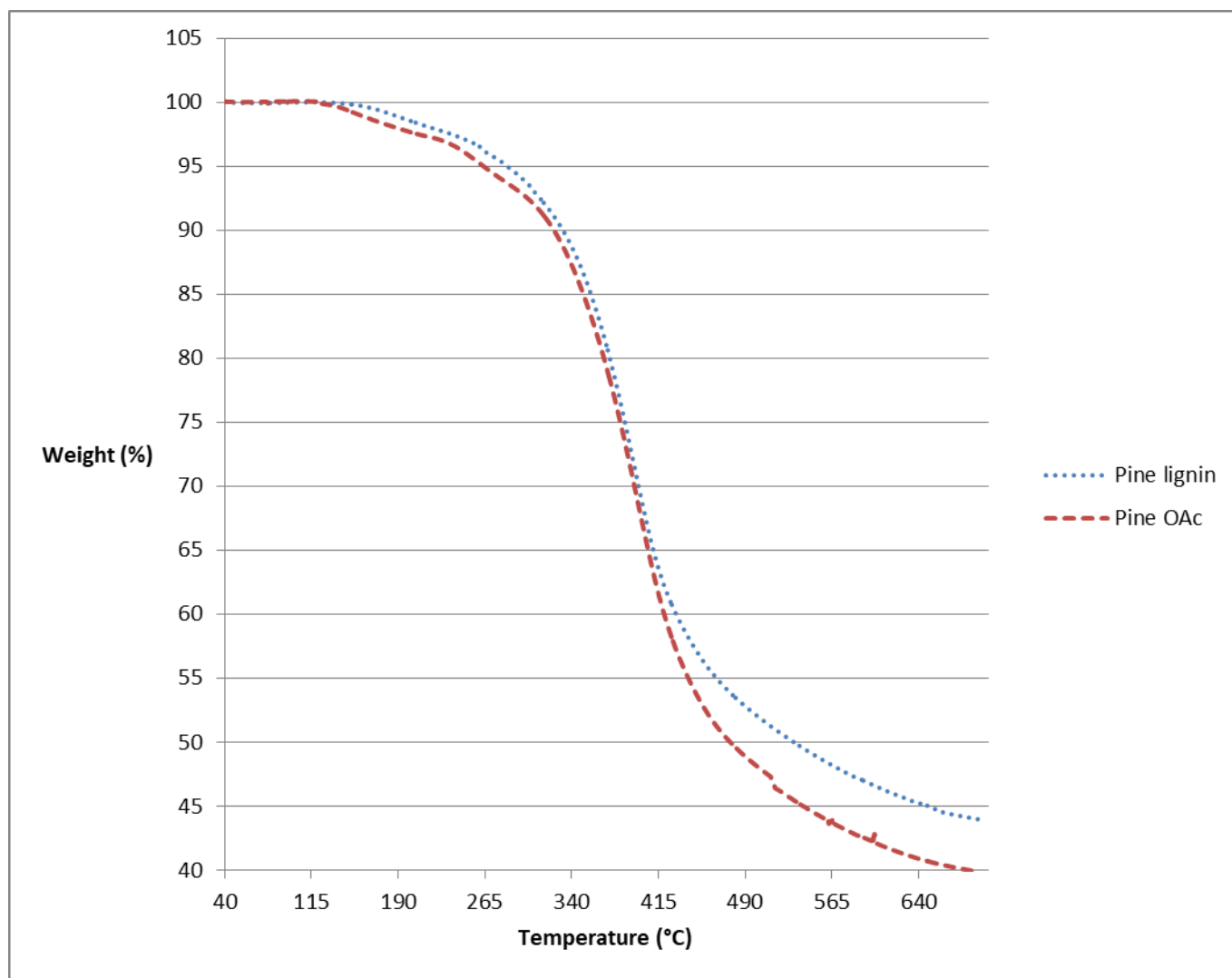


Figure S16. TGA of pine lignin and acetylated pine lignin after extensive drying