HYDROTHERMAL LIQUEFACTION OF MODEL COMPONENTS OF BIOMASS FOR YIELD PREDICITON

[1]JIE YANG, [2]QUAN SOPHIA HE

Department of Engineering, Faculty of Agriculture, Dalhousie University, Truro, NS B2N 5E3, Canada
E-mail: quan.he@dal.ca, jie.yang@dal.ca

Abstract - Hydrothermal liquefaction (HTL) is a promising technology for crude bio-oil production from a variety of biomass, however, there is a lack of prediction models for HTL products and understanding of reaction pathways. Prediction models for biocrude yield and solid residue yield were developed by using a mixture design of five model components, including xylan (hemicellulose), crystalline cellulose, alkaline lignin, soya protein and soybean oil in this study. The model predictability was verified by using actual feedstock as well as a mixture of model components based on the chemical composition of that feedstock. The biocrude yield, solid residue yield and quantitative chemical yields obtained from bio-oil characterization were used to explore the possible reaction pathways as well as synergistic and/or antagonistic interactions between two studied model components.

Keywords - Hydrothermal Liquefaction, Quantitative Prediction Model, Bio-Oil, Mixture Design.

Table 1. The prediction models for biocrude and solid residue yield

Model components	Soya protein (X_1, wt.%)	Xylan (X_2, wt.%)	Microcrystalline cellulose (X_3, wt.%)	Alkaline lignin (X_4, wt.%)	Soybean oil (X_5, wt.%)
Biocrude yield (wt.%) = $19.88*X_1 + 4.29*X_2 + 12.00*X_3 + 2.13*X_4 + 95.18*X_5 + 59.04*X_2X_5 + 37.94*X_3X_5$					(R^2 (adj) = 95.62%)
SR yield (wt.%) = $5.88*X_1 + 21.04*X_2 + 31.65*X_3 + 39.29*X_4 + 0.57*X_5 - 86.33*X_3X_4$					(R^2 (adj) = 86.16%)

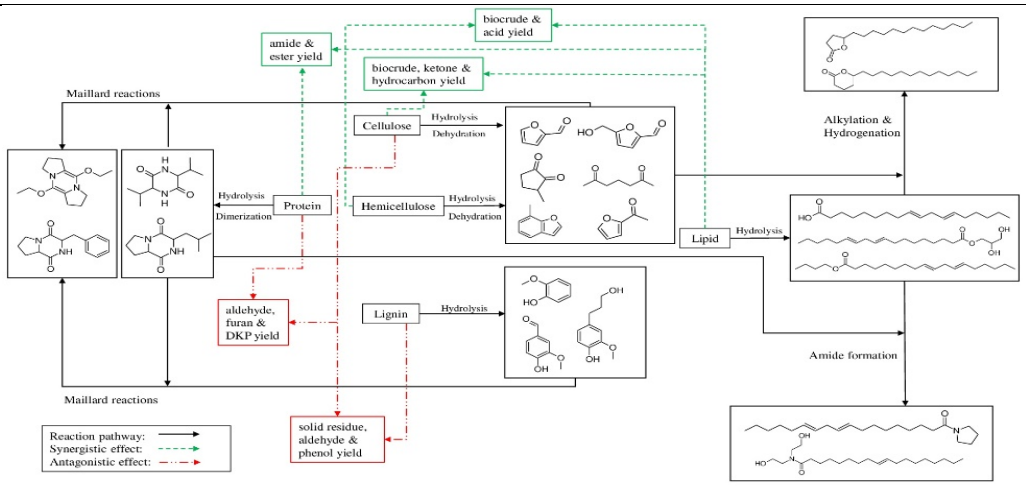


Fig 1. Decomposition pathways of individual model components and related interactions.

REFERENCES

[1] Biller P, Ross AB. Bioresour Technol 2011;102:215-25.
[2] Sheehan JD, Savage PE. Bioresour Technol 2017; 239:144-50

★★★