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Upgrading Biomass into Higher Value Chemicals by Using Low Temperature Plasma ELIJAH THIMSEN, YU GAO, NECIP UNER, JAMES MEYER, MARCUS FOSTON, Washington Univ — Low temperature plasmas (LTP) have been successively progressing into a general tool for solids processing. In this study, we focus on the interaction of a radio frequency low temperature plasma with a morphologically and chemically complex substrate: lignocellulosic biomass (i.e. switchgrass). As an alternative to conventional thermal decomposition for converting biomass into higher value products, we propose a new type of reactor based on LTP. LTP is intriguing for the conversion of biomass into higher value products because the nonequilibrium environment may provide selectivity that is unfavorable in thermal processes. Preliminary experiments on switchgrass in an argon/hydrogen plasma show promising reaction rates and a relatively narrow product spectrum. The solid feedstock is directly converted into simple hydrocarbons that are deoxygenated (e.g. $C_{2-4}H_x$) with high mass yield of approximately 8%. The plasma process does not require precious metal catalysts to perform the conversion, a feat that is nearly impossible in a single step by conventional thermal methods. A study of the effects of gas composition, power density, pressure and biomass feedstock on final product distribution will be presented.

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