

[Understanding cellulose pyrolysis under hydrogen atmosphere](#)

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Abstract:

The product distributions of cellulose pyrolysis under different pressures, temperatures, and atmospheres were investigated using a high-pressure micropyrolyzer to clarify the pyrolysis reaction mechanism of cellulose decomposition with hydrogen. EGA-MS results shows that the increase in hydrogen pressure prolonged the second stage of cellulose pyrolysis, which was dominated by decarboxylation. Pyrolysis products of cellulose under helium mainly included levoglucosan, furfural, and acids, while cellulose hydrolypyrolysis mainly produced C5-C7 ketones, besides small amount of alcohols, aromatics and aliphatic hydrocarbons, and even small amount of phenolics. Carbon yield of ketones was as high as 27.2 % from cellulose hydrolypyrolysis under 2.5 MPa hydrogen and 500 °C. The yield of liquid products and non-condensable hydrocarbons increased with elevated hydrogen pressure. The formation mechanisms of aromatics, phenolics, aliphatic hydrocarbons, aldehydes, ketones, and alcohols under hydrogen atmosphere were discussed. Acetaldehyde was produced by acids through a HDO reaction. C5-C7 chain ketones and cyclic ketones were generated by furfural through HDO and hydrocracking reactions. The Diels–Alder reaction to generate aromatics was enhanced by increasing pyrolysis temperature under hydrogen atmosphere. The reaction network of cellulose hydrolypyrolysis was also proposed.

* Excerpted from online journal website (Click the title)

Frontier Labs Products used:

Multi-Shot Pyrolyzer (EGA/PY-303D), Tandem micro-Reactor (Rx-3050TR)