**Development of a General Kinetic Model based on Chemical Compositions of Lignocellulosic Biomass for Predicting Product Yields from Hydrothermal Liquefaction**

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**Motivation and Background**

- Energy Demand Growth
- Environmental Impacts
- Fossil Fuel Depletion

Intensive research on exploring alternatives to fossil resources for both energy and chemical production. Bioresources, such as lignocellulosic biomass, food waste and algal biomass, are promising candidates to produce bioenergy and bio-based chemicals. Hydrothermal liquefaction is one of the promising methods to convert biomass into valuable products.

**Objectives**

To develop a general kinetic model based on the chemical compositions (cellulose, hemicellulose, and lignin) of lignocellulosic biomass to predict product yields (gas, liquid, and solid residue) and elucidate the reaction pathways and mechanisms in HTL of lignocellulosic biomass.

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**Research Methodology**

**Reaction Network**

- Feedstocks → [Cellulose] → [Hemicellulose] → [Lignin] → [Bio-oil] → [Gas] → [Solid residue]

**Reaction Rate**

1. \[ \frac{dX_{feed}}{dt} = -(k_1 + k_2 + k_3)X_{feed} \]
2. \[ \frac{dX_{bio}}{dt} = k_1X_{feed} + k_3X_{cell} - (k_5 + k_6)X_{bio} \]
3. \[ \frac{dX_{oil}}{dt} = k_5X_{feed} - (k_1 + k_2 + k_3)X_{oil} \]
4. \[ \frac{dX_{gas}}{dt} = k_7X_{bio} + k_8X_{oil} \]

**Key Results**

- Curve fitting of experimental data
- Comparison of HTL product yields obtained by model predictions and by experiments reported in literature

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