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U.S. Department  
of Transportation



Project Title: **Bio-Oil from Fast Pyrolysis of Forage Sorghum Biomass**

## DR. DONGHAI WANG

### Project Goal

Bio-oil production has great potential to produce high heat content fuels including higher alcohols, “green” gasoline and diesel, and aviation fuels. The goal of this proposed research was to develop a comprehensive understanding of the use of sorghum biomass for bio-oil production through fast pyrolysis. The specific objectives are: 1) Characterize the chemical composition and physical and thermal properties of forage sorghum biomass related to pyrolysis processing; 2) Develop a coordinated understanding of the relationship between composition, physical and thermal properties, processing condition, and bio-oil yield; and 3) Determine the optimum pyrolysis conditions for high bio-oil yield and low energy input.

### Project Outcomes

- Chemical composition of the sorghum biomasses were analyzed following the NREL standard procedures and ranged from 38-44% cellulose, 18-26% hemicellulose, 13-20% lignin, and 7.5-11% ash. The total carbohydrate composition ranged from 51-69%.
- Little biomass (<1%) was pyrolyzed at temperatures below 300 °C & a minimal amount (~2%) was left after a 600 °C pyrolysis, as well.
- The results also indicated bio-oil produced through catalytic fast pyrolysis of biomass were mainly hydrocarbons, which can be converted into fuels including “green” gasoline, diesel and jet fuels by utilizing the same refining technologies employed by the current petroleum and coal-based fuel industry.
- Results from this research may be used for the design and construction of catalytic fast pyrolysis reactors for the production of high quality bio-oils readily amenable for the existing fuel industries.



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