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U.S. Department
of Transportation



Project Title: ***Developing a Cost-Effective Technology for Conditioning Biomass-Generated Syngas with In-Situ Bed of Biochar-Based Catalysts***

DR. Ajay Kumar

Project Goal

Kumar's long-term goal is to break barriers of converting biomass resources into fuels, chemicals and power through gasification process so that a successful bio-based economy can be feasible. The project main objectives is to develop a novel patentable technology to produce syngas with low tar and high hydrogen to carbon monoxide ratio. His rationale is that in-situ syngas conditioning, if effective, can drastically reduce the technical and economical penalty associated with conditioning (upgrading) syngas for production of fungible fuels. To accomplish the goal, the three specific objectives are to: (1) identify key factors for design and operation of the novel reactor, (2) determine effects of catalysts and operating conditions on syngas composition and yield, and (3) compare the cost and sustainability indices of the technology developed with the conventional technology.

Project Outcomes

- Biochar supported nickel catalysts have been developed through different preparation methods. The catalysts are also characterized.
- Effects of preparation methods on properties of biochar supported catalysts were studied. The properties of catalysts include surface textural properties (surface area and surface functional groups), nickel dispersions.
- Surface areas and pore distributions were determined using N₂ isotherm method.
- Surface functional groups on biochar supports were analyzed using temperature controlled desorption and FTIR.
- The nickel dispersion and nickel particle sizes on the biochar supports were analyzed using transmission electronic microscopy.
- The model tar reforming experiment using biochar based catalyst has been carried out in a pyroprobe.



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All senior personnel are employed by Oklahoma State University in the *Biosystems & Agricultural Engineering Department*

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Other Sources of

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