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Pilot-Scale Gasification of Woody Biomass and Production of Liquid Transportation Fuel

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A continuous, pilot-scale downdraft gasifier, utilizing approximately 25kg of woody biomass per hour has been used to evaluate various feedstocks and operating conditions for the production of synthesis gas which is catalytically converted to hydrocarbon based liquid transportation fuels. Feedstocks that have been examined include southern pine grown under different environmental conditions and mixed southern hardwoods, with variation in the gas flow rate through the system. The gasifier has an open design, operating at ambient pressure with no air lock, at 800-1000°C, and flow rates of ~55 scmh, resulting in a synthesis gas composed of 20-25% CO, 15-20% H_2, 10-12% CO_2, 3-5% CH_4 and 0.2-0.3% O_2. The syngas is compressed with a two-stage pressurization system and stored in gas cylinders at approximately 2000psi. Catalytic processing of the synthesis gas is performed with a bench-scale high pressure microreactor using Fe/Co-based Fischer-Tropsch catalysts for the production of hydrocarbons in the range of synthetic gasoline and diesel.