



PROJECT FACTS

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CLEAN FUELS & CHEMICALS

Sensitivity of Fischer-Tropsch Synthesis and Water-Gas Shift Catalysts to Poisons from High-Temperature High-Pressure Entrained-flow (EF) Oxygen-Blown Gasifier Gasification of Coal/Biomass Mixtures

There has been a recent shift in interest in converting not only natural gas and coal derived syngas to Fischer-Tropsch synthesis products, but also converting biomass-derived syngas, as well as syngas derived from coal and biomass mixtures. As such, conventional catalysts based on iron and cobalt may not be suitable without proper development. This is because, while ash, sulfur compounds, traces of metals, halide compounds, and nitrogen-containing chemicals will likely be lower in concentration in syngas derived from mixtures of coal and biomass (i.e., using entrained-flow oxygen-blown gasifier gasification) than solely from coal, other compounds may actually be increased.

Of particular concern are compounds containing alkali chemicals like the chlorides of sodium and potassium at the 100 ppbw level. In addition, CAER is also carrying out tests by co-feeding 1 ppmv H₂S and 1 ppmv NH₃ (separately and together) in order to shed light on the individual as well as compounding effects of sulfur and nitrogen chemicals. Additional contaminants of concern are HCl, HBr, HF, and HCN.

The CAER houses a battery of >20 continuously stirred tank reactors for carrying out Fischer-Tropsch synthesis over both cobalt and iron-based catalysts, as well as fixed bed reactors for investigating WGS. CAER is working with the DOE-NETL to ascertain the impact of these higher sodium and potassium alkali levels, as well as other contaminants, on not only the performance of WGS and FT processes, but also of the impact on the catalyst structure-function properties.