The Economical Production of Alcohol Fuels from Coal-Derived Synthesis Gas

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Abstract

This project was divided into two parts. One part evaluated possible catalysts for producing higher-alcohols (C_2 to C_{5+}) as fuel additives. The other part provided guidance by looking both at the economics of mixed-alcohol production from coal-derived syngas and the effect of higher alcohol addition on gasoline octane and engine performance. The catalysts studied for higher-alcohol synthesis were molybdenum sulfides promoted with potassium. The best catalysts produced alcohols at a rate of 200 g/ kg of catalyst/ h. Higher-alcohol selectivity was over 40%. The hydrocarbon by-product was less than 20%. These catalysts met established success criteria. The economics for mixed alcohols produced from coal were poor compared to mixed alcohols produced from natural gas. Syngas from natural gas was always less expensive than syngas from coal. Engine tests showed that mixed alcohols added to gasoline significantly improved fuel quality. Mixed-alcohols as produced by our catalysts enhanced gasoline octane and decreased engine emissions. Mixed-alcohol addition gave better results than adding individual alcohols as had been done in the 1980's when some refiners added methanol or ethanol to gasoline.

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