Direct Catalytic Liquefaction of Low-Volatile Hydrocarbons to Liquid Fuels

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ABSTRACT

We have developed a direct catalytic liquefaction process to convert low-volatile hydrocarbons such as coal, petroleum vacuum gas-oil, and tar sand bitumen into clean, light liquid fuels. The technology is based on an efficient reactor system and highly active nano-catalysts. This patented process [1] has low emissions of green- house gases and air pollutants, is cost effective, and is significantly superior to current commercial processes. The estimated cost of liquid fuel is <$42 per barrel.

Key Words: direct catalytic liquefaction, liquid fuel, nano-catalysis, coal liquefaction, petroleum residua liquefaction

TECHNICAL DESCRIPTION

Energy Catalysis, Inc. (ECI) is a small research and development business with greater than twenty years of experience in catalysis, coal liquefaction, and petroleum residua conversion. ECI has developed a direct catalytic liquefaction process for converting low-volatile hydrocarbons such as coal, petroleum residuum, vacuum gas-oil, and tar sand bitumen into clean, light liquid fuels. The technology was developed under the Department of Energy's Phase I and Phase II Small Business Innovative Research program. The technology concept was based on an efficient two-stage reactor system and specific nano-catalysts hydrocracking at <450°C. The ECI process uses highly active nano-catalysts in an efficient reactor system to avoid back-mixing and retrogressive reactions. The typical product yield from liquefaction of bituminous coal is: 80 w% liquid mostly in the C_4-650°F range, 5 w% C_1-C_3 gases, and no tar. Since the liquid products are already in the gasoline and diesel fuel range, no further processing in the Fluid Catalytic Cracking Unit of a petroleum refinery is needed. The estimated cost of liquid product is $38 to $42 per barrel. The process has very low emissions of green-house gases and air pollutants. The U.S. patent was granted for the process in January, 2012.

The ECI process is significantly superior to current commercial processes for converting low-volatile hydrocarbons to clean, light liquid fuels. The technology serves the purpose of a coal-based refinery or an alternate petroleum refinery with low air emissions..

ECI is now looking for venture capitalists and corporate partners to develop and license the process to commercialization.

REFERENCE

[1] Ganguli P.S. and Comolli A.G., U.S. Patent 8092672 (2012)