

## Performance Characteristics of a Tubular Direct Carbon Fuel Cell Stack Coupled with Dry Coal Gasifier

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A carbon gasified-direct carbon fuel cell (DCFC) stack has been fabricated and investigated for producing effective carbon fuel cell reaction. The anode-supported tubular cells with 45 cm<sup>2</sup> active area were used for making the DCFC stack, which was coupled with a reverse boudouard reaction fluidized bed gasifier. The activated carbon (BET area 1800 m<sup>2</sup>/g) powder was mixed with K<sub>2</sub>CO<sub>3</sub> powder and the mixed carbon powders as fuel were supplied to the fluidized bed and the direct carbon fuel cell stack by flowing CO<sub>2</sub>. The induced CO fuel by a reverse boudouard reaction at the fluidized bed reactor increased the stack performance. The tubular DCFC stack showed a maximum power of 30 W at 750 °C; it was operated at variable operating conditions: operating temperature, flow rates of CO<sub>2</sub> and anode gas composition. These results indicate that the fabricated tubular DCFC is a promising candidate of power generator for many other practical applications, such as residential power generation (RPG) and stationary power systems.