

Coal Conversion in a Fluidized Bed Direct Carbon Fuel Cell

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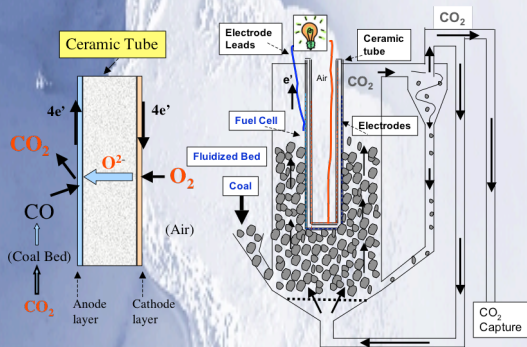
Direct Carbon Technologies (DCT) is developing its proprietary fluidized bed direct carbon fuel cell (FB-DCFC) technology to commercialization.

DCT has already demonstrated efficient conversion of coal, carbon and biomass into electricity in its proprietary FB-DCFC [1-4].

"Direct" implies to conversion in a single process chamber.

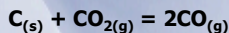
FB-DCFC's Advantages

- Flexibility to employ a wide range of solid fuels
- Consumes no water
- No nitrogen enters process stream
- Produces capture-ready CO₂
- High conversion efficiency
- Less coal or biomass per unit of electricity generated
- Produces less CO₂ per unit of electricity generated
- No or minimal NO_x emissions

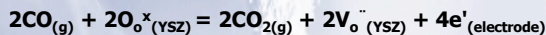


Operating Principle of FB-DCFC (Current Understanding)

Boudouard reaction in coal bed



On SOFC anode



Net Bed-side



On SOFC Cathode



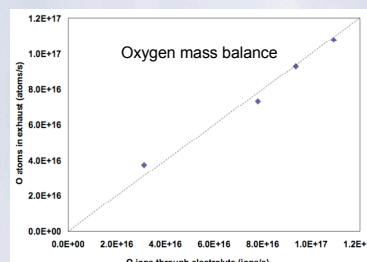
OVERALL Cell Reaction



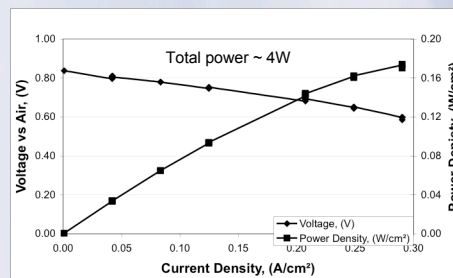
Solid fuels converted in FB-DCFC

Coal
Coal
Coal
Synthetic carbon
Activated carbon
Activated carbon
Biomass

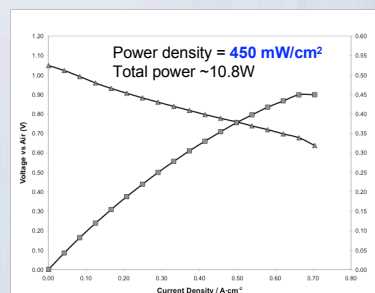
Lower Kittanning, PA
Pittsburgh #8, PA
Waterfall Seam, Kenai-Cook Inlet County, AK
Osaka Gas
Fisher
(biomass derived)
Almond shells



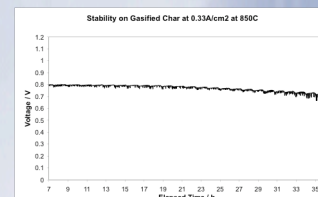
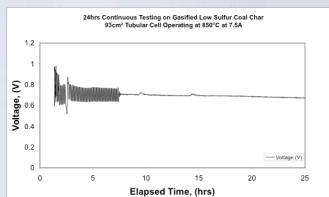
FB-DCFC on Activated Carbon at 850 °C



FB-DCFC on Alaska Coal Char at 850 °C



FB-DCFC Stability Testing at 850 °C on Gasified Coal



References:

1. A. C. Lee, S. Li, R. E. Mitchell, T. M. Gür, *Electrochem. Solid-State Lett.* **11**(2), B20 (2008)
2. S. Li, A. C. Lee, R. E. Mitchell, T. M. Gür, *Solid State Ionics* **179**, 1549 (2008)
3. A. C. Lee, R. E. Mitchell, T. M. Gür, *AIChE Journal* **55**(4), 983 (2009)
4. A. C. Lee, R. E. Mitchell, T. M. Gür, *J. Power Sources* (in print)

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