

Electrochemical performance of direct carbon fuel cell(DCFC) with molten carbonate electrolyte

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This research focuses on using the abundant coal reserves to create carbon fuels for the production of energy in a very efficient and environmentally friendly process via the use of a Direct Carbon Fuel Cell (DCFC). The carbon microstructure and the reaction mechanism will be discussed. The maximum power densities obtained were 17.5, 25.0, 30.0, 43.0, 46.0, and 17.5 mW/cm² at 600, 650, 700, 750, 800, and 850oC, respectively. DCFC fuels were mixed with electrolyte because Temperature Programmed Oxidation (TPO) data was shown mixed electrolyte and carbon fuels was oxidized at low temperature(670oC). This temperature is lower than my target temperature (700oC). The maximum power density of 33.0mW/cm² was achieved using mixture of activation carbon and electrolyte (1:1wt%) as fuel at 650oC. The maximum power density was 98.8mW/cm² for the cell using mixture of graphite and electrolyte at the mass ratio of 1:1.5 at 650oC. The maximum power density of 31.6mw/cm² was achieved when the nickel fiber sheet was used as catalyst of carbon oxidation.