# Performance of Direct Carbon Fuel Cells by Boudouard Reaction

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Direct carbon fuel cell (DCFC) can be a 'High risk and High impact' technology in terms of energy security and environmental protection. Solid carbons or coals are directly used as a fuel without the need for combustion or gasification. Moreover, DCFC system has relatively higher achievable efficiency 80% on a theoretical basis than that of molten carbonate and solid oxide fuel cells. In spite of several advantages, direct oxidation of carbon fuels is very hard to achieve at the TPB (triple phase boundary) due to the technical difficulties of well-established contact sites formation between two solid phases. Therefore, the anode reaction mechanism becomes more complex than that of gas fueled high temperature fuel cells. In this study, the mixed fuel supply was speculated to overcome the poor solid-solid reaction by using Boudouard reaction ($C+CO_2 \rightarrow 2CO$). The CO is thought to subsequently react and oxidize to $CO_2$ electrochemically at the TPB ($CO+O^2 \rightarrow CO_2+2e^-$). Anode catalyst layer is composed of commercial activated carbon mixed with Ni or Sn powder as a catalyst, and coated on the SOFC type button cell. Its operation of the single cell has been extensively demonstrated at various operating conditions.