technical development, capital cost is still the main obstacle to be overcome. Longer production runs should provide much of the cost reductions needed. Improvements in platinum catalyst technology are playing an important part, both by providing better utilisation of the noble metals, and by increasing the power outputs of the fuel cell assemblies. The successful commercial development of second generation concepts such as molten carbonate and solid oxide fuel cells are likely to be dependent on the effective exploitation of phosphoric acid fuel cells, and the establishment of a market for such devices.

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A New Process for Direct Coal Gasification

It is known that fuel cells can be used to cogenerate electricity and useful chemicals, and also that there are important technological advantages in gasifying coal in a molten metal bath. The latter is a relatively new process which has attracted significant attention, particularly in Japan. Now I. V. Yentekakis and P. G. Debenedetti of Princeton University and B. Costa of Naples, Italy, have reported a novel concept for coal gasification, which involves the simultaneous gasification of coal and the generation of electrical power in a single reactor which is a combination of a high-temperature solid electrolyte fuel cell and a fused metal gasifier (*Ind. Eng. Chem. Res.*, 1989, **28**, (9), 1414–1424).

Finely divided carbon is carried in an inert gas flow to the molten iron which serves as the anode. The cathodic compartment of the cell consists of yttria stabilised zirconia, and the inner walls of the electrolyte are coated with a porous platinum film which has high catalytic activity for the dissociation of oxygen.

The process combines the advantages associated with coal gasification in a molten metal bath, namely high gasification efficiency and low sulphur content in the gas, with the thermodynamic efficiency of high temperature fuel cells. A lumped parameter model is presented. Calculations support the opinion that the fused iron bath fuel cell concept is an attractive idea, worthy of experimental testing.