

Performance evaluation of tubular solid oxide carbon fuel cells operating on steam gasified carbon fuels

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The operating characteristics of solid oxide fuel cells (SOFC) on syngas produced from steam gasification of activated carbon (AC), activated carbon with K₂CO₃ and biomass driven charcoal were investigated. The gasification was carried out in an indigenously designed fixed bed gasifier, which was directly integrated with the performance evaluation system for the tubular SOFC. The effect of gasification temperature on the electrochemical performance of CFC was analyzed. The syngas compositions were measured quantitatively by using gas chromatography (GC) and optimum steam gasification conditions for all carbon fuel types were determined. At 850°C, the maximum power density from steam gasified syngas from activated carbon (AC), activated carbon with K₂CO₃ and biomass driven charcoal was 108 mW/cm², 180 mW/cm², 161 mW/cm², respectively. CFC was relatively successfully operated during over 100 hours under galvanostatic conditions, with degradation rate of 0.9mV/hr.