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Study on Ceria Coated MCFC Anode as Electrolyte Reservoir and H_2S Tolerant

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One of the Molten Carbonate Fuel Cell (MCFC) advantage is wide range of various fuels, such as, hydrogen, natural gas, coal, etc. The highest performance achieved when hydrogen is used as the fuel. Unfortunately, hydrogen is also the most expensive of all fuels. To overcome this problem, natural gas or coal which consists of methane as hydrogen source is considered as fuel. The major drawback of using natural gas or coal is these fuels contain H_2S as impurity. At atmospheric pressure, less than 10 ppm of H_2S is enough to make voltage losses due to chemisorptions on Ni surfaces and block active electrochemical sites caused by H_2S. To enhance the anode performance on sulfur tolerance, ceria coating on anode is proposed. The objective of this research is to study the effect of ceria coated anode as sulfur tolerant and electrolyte reservoir. This research limits only in single cell test at 650℃ and 1atm, with methane and H_2S as impurities under steam reforming and partial oxidation reaction. Ceria coated anode was fabricated for use in molten carbonate fuel cell by dip coating method. 1-5 w% coating ratios for ceria were made to investigate the effect of ceramic coating in anode wettability and ceria coating had an effect on surface modification of anode which increased anode wettability. No reaction between ceria and electrolyte in anode condition. Electrode performance is proportional to wettability behavior. Optimal ceria coating ratio is 1-2%. H_2S is poisoning Ni catalyst in both partial oxidation and steam reforming condition.