Methane reforming by carbon dioxide in SOFC type reactor with Ceria based membrane

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This study focused on the simultaneous generation of synthesis gas and electricity during the methane dry reforming by carbon dioxide in Solid Oxide Fuel Cell (SOFC) reactor. To make composite electrolytes, doped ceria powders were prepared by coprecipitation method. And the doping materials were samarium, gadolinium and yttrium. The reduction of ceria in reducing atmosphere deteriorates the power density due to mixed ionic-electronic conduction. To overcome this disadvantage, YSZ thin film was deposited on each ceria-based electrolyte. In order to coating the YSZ thin films onto ceria based electrolyte, Sol-gel spin coating and colloidal coating was used. The ceria-based composite electrolyte with YSZ film fabricated by the sol-gel spin coating had many cracks. However, the composite electrolyte prepared by the colloidal solution was crack-free. When the SOFC reactor was operated at intermediate temperature, i.e. 800℃, the power generation performances of the SOFC reactor with ceria-based electrolyte increased SDC > GDC > YDC. The power generation performance of them was higher than that of the YSZ-based reactor.