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Performance of Rh/Al_2O_3 catalyst in the steam reforming of ethanol: H_2 production for MCFC

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Abstract

The steam reforming of ethanol on 5% Rh/Al_2O_3 catalyst has been investigated to produce H_2 adequate to feed a molten carbonate fuel cell (MCFC). The influence of reaction temperature, H_2O/EtOH molar ratio, gas hourly space velocities (GHSV) and O_2 were investigated in order to maximize the hydrogen content at the outlet of ethanol reformer. Endurance tests to assess the feasibility of a FC system fed by simulated bio-EtOH stream (H_2O/EtOH molar ratio=8.4) were also performed. Experiments carried out at MCFC operative conditions allowed to obtain a H_2 reach mixture close to 60% on dry basis. In steam reforming (SR) conditions an extensive formation of *encapsulated carbon* was registered while a great benefits, both in terms of catalyst stability and coke formation were evidenced adding 0.4Â vol.% of oxygen in the reaction stream. Oxygen however promoted metal sintering. Consideration on

reaction mechanism, mainly investigated to distinguish the reaction pathway influencing the H_2 production, is reported.

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Keywords

Ethanol; Steam reforming; Rh catalyst; H_2 production

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