Steam-Methane reforming in a steam plasma using 2.45 GHz microwave system

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Hydrogen can be produced from natural gas by means of three different chemical processes that are steam reforming, partial oxidation and autothermal reforming reaction. In case of steam reforming, is used in industry and that hydrogen yield is highest of the three reforming types. However, it is required careful thermal management. A steam-methane reforming (SMR) has been carried out at the temperature ranges of 700 ~ 1000 °C in a catalyst reactor. The catalyst during the reforming reaction is agglomerated in the temperatures, showing the degradation of catalytic performance with a carbon deposition on the activity surface of catalyst. To overcome the problems, In this work, we report the methane reforming in a steam plasma generated by 2.45 GHz microwaves at atmospheric pressure. The steam microwave plasma can provide highly active species and high-temperature in tens of microseconds, enhancing the chemical reaction rate and eliminating the need for catalysts. Therefore, We investigate the dependence of conventration in terms of rations of steam to carbon at a given plasma power, showing high hydrogen concentration and fast response time for SMR reaction in a specially designed plasma reactor.

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