

Microwave Plasma Dry Reforming of Methane at High CO₂/CH₄ Feed Ratio

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Abstract : Dry reforming of methane that converts two greenhouses gases (CH₄ and CO₂) to synthesis gas (a mixture of H₂ and CO) was studied in a commercial bench scale microwave (MW) plasma reactor system at atmospheric pressure. The CO₂, CH₄ and N₂ conversions; H₂, CO selectivities and yields, and syngas ratio (H₂/CO) were investigated in a wide range of total feed flow rate (0.45 – 2.1 L/min), MW power (700 – 1200 watt) and CO₂/CH₄ molar ratio (2 – 5). At the feed flow rates of CH₄, CO₂ and N₂ of 0.2, 0.4 and 1.5 L/min respectively, and the MWs input power of 700 W, the highest conversions of CH₄ and CO₂, selectivity and yield of H₂, CO and H₂/CO ratio of 79.35%, 44.82%, 50.12, 58.42, 39.77%, 32.89%, and 0.86, respectively, were achieved. The results of this work show that the product ratio increases slightly with the increasing total feed flow rate, but it decreases significantly with the increasing MW power and feeds CO₂/CH₄ ratio.

Keywords : dry reforming of methane, microwave discharge, plasma technology, synthesis gas production

Conference Title : ICCENS 2018 : International Conference on Chemical Engineering and Nanoparticle Synthesis

Conference Location : Paris, France

Conference Dates : August 27-28, 2018