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Reforming of CO_2-Containing Natural Gas by Using an AC Gliding Arc Discharge Plasma System

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Abstract : The increasing in global energy demand has affected the climate change caused by the generation of greenhouse gases. Therefore, the objective of this work was to investigate a direct production of synthesis gas from a CO_2-containing natural gas by using gliding arc discharge plasma technology. In this research, the effects of steam reforming, combined steam reforming and partial oxidation, and using multistage gliding arc discharge system on the process performance have been discussed. The simulated natural gas used in this study contains 70% methane, 5% ethane, 5% propane, and 20% carbon dioxide. In comparison with different plasma reforming processes (under their optimum conditions), the steam reforming provides the highest H_2 selectivity resulting from the cracking reaction of steam. In addition, the combined steam reforming and partial oxidation process gives a very high CO production implying that the addition of both oxygen and steam can offer the acceptably highest synthesis gas production. The stage number of plasma reactor plays an important role in the improvement of CO_2 conversion. Moreover, 3 stage number of plasma reactor is considered as an optimum stage number for the reforming of CO_2-containing natural gas with steam and partial oxidation in term of providing low energy consumption as compared with other plasma reforming processes.

Keywords : natural gas, reforming process, gliding arc discharge, plasma technology
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