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Reforming of biogas to synthesis gas by a rotating arc plasma at atmospheric pressure WOO-JAE CHUNG, HYUN-WOO PARK, JING-LIN LIU, DONG-WHA PARK, Department of Chemistry and Chemical Engineering, Inha University — In order to produce synthesis gas, reforming of biogas composed with 60 percent for CH₄ and 40 percent for CO₂ was performed by a novel rotating arc plasma process. The effect of O₂/CH₄ ratio on the conversion, syngas composition and energy cost was investigated to evaluate the performance of proposed system compared with conventional gliding arc plasma process. When the O₂/CH₄ ratio was increased from 0.4 to 0.9, the conversions of CH₄ and O₂ increased up to 97.5 percent and 98.8 percent, respectively, while CO₂ conversion was almost constant to be 38.6 percent. This is due to more enhance the partial oxidation of CH₄ to CO and H₂ than that of dry reforming by increasing the O₂/CH₄ ratio. In this work, energy cost of 32 kJ/mol was achieved with high syngas composition of 71 percent using pure O₂ as oxidant reactant. These are lower than those of different arc plasma processes (energy cost of 122 - 1870 kJ/mol) such as spark, spark-shade and gliding arc plasma. Because, this rotating arc plasma can remain in a long arc length and a large volume of plasma with constant arc length mode.

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