REFERENCES

Cancino, J. F. (2001). Process Thermodynamics Analysis of Syngas Production. M. S. Thesis, The University of Oklahoma.

Chang, J.-S., Lawless, P. A., and Yamamoto, T. (1991) Corona discharge processes. IEEE Transactions on Plasma Science, 19(6), 1152-1166.

Eliasson, B., Hirth, M., and Kogelschatz, U. (1987). Ozone synthesis from oxygen in dielectric barrier discharge. Journal of Applied Physics, 20, 1421-1437.

Eliasson, B. and Kogelschatz, U. (1991). Nonequilibrium Volume Plasma Chemical Processing. IEEE Transactions on Plasma Science, 19(6), 1063-1077.

Elmasides, C., Kondarides, D. I., Neophytides, S. G., and Verykios, X. E. (2001). Partial oxidation of methane to synthesis gas over Ru/TiO_2 catalysts: Effects of modification of the support on oxidation state and catalytic performance. Journal of Catalysis, 198, 195-207.

Futamura, S., Einaga, H., and Zhang, A. (2001). Comparison of reactor performance in the nonthermal plasma chemical processing of hazardous air pollutants. IEEE Transactions on Industry Applications, 37(4), 978-985.

Grill, A. (1994). Cold Plasma in Materials Fabrication: From Fundamentals to Applications. IEEE Press: New York.

Hill, B. J. (1997). The Oxidation Coupling of Methane Using an AC Electric Gas Discharge. M. S. Thesis, The University of Oklahoma.

Huang, L., Nakajyo, K., Hari, T., Ozawa, S., and Matsuda, H. (2001). Decomposition of carbon tetrachloride by a pulsed corona reactor incorporated with in situ absorption. Industrial and Engineering Chemistry Research, 40, 5481-5486.

Larkin, D. W. (2000). The Partial Oxidation of Methane to Organic Oxygenate Liquids Using a Dielectric Barrier Discharge Reactor. Ph. D. Thesis, The University of Oklahoma.

Mutaf-Yardimci, O., Saveliev, A. V., Fridman, A. A., and Kennedy, L. A. (1998). Employing plasma as catalyst in hydrogen production. International Journal of Hydrogen Energy, 23(12), 1109-1111.

Nasser, E. (1971). Fundamentals of Gaseous Ionization and Plasma Electronics, USA: John Wiley & Sons, Inc.

Otsuka, K., Wang, Y., Sunada, E., and Yamanaka, I. (1998). Direct partial oxidation of methane to synthesis gas by cerium oxide. Journal of Catalysis, 175, 152-160.

Rosacha, L. A., Anderson, G. K., Bechtold, L. A., Coogan, J. J., Heck, H. G., Kang, M., McCulla, W. H., Tennant, R. A., and Wantuck, P. J. (1993). Treatment of hazardous organic wastes using silent discharge plasmas. Non-Thermal Plasma Technique for Pollution Control., NATO ASI series, 34, part B, 128-139.

Stagg-Williams, S. M., Noronha, F. B., Fendley, G., and Resasco, D. E. (2000). CO_2 reforming of CH_4 over Pt/ZrO_2 catalysts promoted with La and Ce oxides. Journal of Catalysis, 194, 240-249.

Thanyachotpaiboon, K., Chavadej, S., Caldwell, T. A., Lobban, L. L., and Mallinson, R. G. (1998). Conversion of methane to higher hydrocarbons in AC nonequilibrium plasmas. AIChE Journal, 44(10), 2252-2257.

Wender, I. (1996). Reactions of synthesis gas. Fuel Processing Technology, 48, 189-297.

Zhang, K., Kogelschatz, U., and Eliasson, B. (2001). Conversion of greenhouse gases to synthesis gas and higher hydrocarbons. Energy & Fuels, 15, 395-402.

Zhou, L. M., Xue, B., Kogelschatz, U., and Eliasson, B. (1998). Nonequilibrium plasma reforming of greenhouse gases to synthesis gas. Energy & Fuels, 12, 1191-1199.

APPENDIX

The total molar flow rate of the gaseous stream was calculated from the following equation:

$$N = q \times \left[\frac{P}{R \times T} \right]$$

Where N = total molar flow rate (mole/min)

q = total volumetric flow rate (determine by using soap bubble meter)

P = total pressure of the system (1 atm)

R = gas constant (82.051 $atm.ml.mol^{-1}.min^{-1}.K^{-1}$)

T = absolute ambient temperature (K)

The molar flow rate of each component can be determined by multiplying its percent volume derived from the GC analysis with the total molar flow rate.

The conversion is defined as:

$$\%\text{Conversion} = \frac{(\text{Mole flow rate reactant in - Mole flow rate reactant out}) \times 100}{\text{Mole flow rate reactant in}}$$

The selectivity of each product is defined based on the amount of reactant carbon converted into any specified products as the following equation:

$$\%C_P \text{ Selectivity} = \frac{P \times \text{Mole flow rate of } C_P \text{ producted} \times 100}{\Sigma\, (R \times \text{Mole flow rate of } C_R \text{ converted})}$$

Where P = number of carbon atom in product

R = number of carbon atom in reactant

C_P = product that has carbon P atom

C_R = reactant that has carbon R atom

To determine the energy efficiency of corona discharge system, the specific energy consumption was calculated in a unit of electron-volt per molecule of converted carbon (eV/m_c) from the following equation:

$$\text{Specific energy consumption} = \frac{P \times 60}{(1.602 \times 10^{-19}) \times \tilde{N} \times M_C}$$

Where P = Power (Watt)

$\tilde{N}$ = Avogadro's number = 6.02 X 10^{23} molecules.g-mole^{-1}

M_C = Rate of carbon in feed gas converted (g-mole.min^{-1})

1 eV = 1.602 X 10^{-19} watt.sec

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1. **Supat, K.**, Chavadej, S., Lobban, L. L., and Mallinson, R. G. (2001) "Carbon Dioxide Reforming with Methane in Low Temperature Plasma" *Proceedings of the 6th World Congress of Chemical Engineering*, Melbourne, Australia, 23-27 September, 8 pages.
2. **Supat, K.**, Chavadej, S., Lobban, L. L., and Mallinson, R. G. (2002) "Synthesis Gas Production from Reforming of Methane with Carbon Dioxide in an AC Electric Discharge over Pt/ZrO_2" *AIChE Spring National Meeting*, New Orleans, USA, 10-14 March, 9 pages.
3. **Supat, K.**, Chavadej, S., Lobban, L. L., and Mallinson, R. G. (2002) "Carbon Dioxide Reforming with Methane in Low Temperature Plasma" *The 223rd ACS National Meeting*, Orlando, Florida, USA, 7-11 April.
4. **Supat, K.**, Chavadej, S., Lobban, L. L., and Mallinson, R. G. (2002) "Conversion of Methane to Synthesis Gas over Pt/KL using Corona Discharge" *The 9th APCChE Congress*, Christchurch, New Zealand, 29 September-3 October, 15 pages.
5. **Supat, K.**, Chavadej, S., Lobban, L. L., and Mallinson, R. G. (2003) "Combined Carbon Dioxide and Steam Reforming with Methane in Low Temperature Plasmas", Utilization of Greenhouse Gases, ACS Symposium Series. (In press)
6. **Supat, K.**, Chavadej, S., Lobban, L. L., and Mallinson, R. G. (2003) "Synthesis Gas Production from Partial Oxidation of Methane with Air in AC Electric Gas Discharge", *Energy & Fuels*. (In press)

7. **Supat, K.**, Chavadej, S., Lobban, L. L., and Mallinson, R. G. (2003) "Simultaneous Steam Reforming and Partial Oxidation of Methane to Synthesis Gas under Electric Discharge", *Industrial and Engineering Chemistry Research*. (In press)