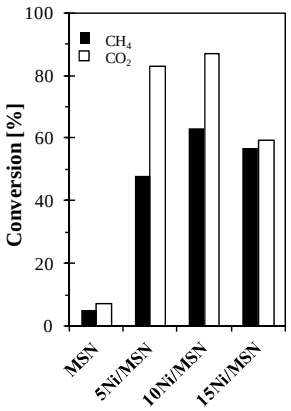
ꯑP094ꯑ Synthesis Gas Production from CO2reforming of CH4 over Ni/MSN

Sidik, S.M.[1], Triwahyono, S.[2,*], Jalil, A.A.[1,3]

[1] Department of Chemical Engineering, Faculty of Chemical Engineering,
[2] Department of Chemistry, Faculty of Science,
[3]Institute of Hydrogen Energy, Faculty of Chemical Engineering,
University Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia.

Catalytic reforming of CH_4 with CO_2 has recently attracted considerable attention due to simultaneous utilization and reduction of two types of greenhouse gases, CO_2 and CH_4 [1]. Catalysts for the CO_2 reforming of CH_4had been extensively investigated. Nevertheless, the commercialization of CO_2 reforming of CH_4 has not been established yet due to the lack of an effective and stable catalyst. Ni-based catalysts are desirable due to their relative economic feasibility and availability [2]. However, Ni-based catalysts usually deactivated because of metal sintering and/or carbon deposition [3]. To improve its catalytic performance, the highly dispersed supported Ni-based catalysts have been investigated as they may provide efficient CH_4 and CO_2 conversion [4]. To date, Ni supported on mesoporous silica has been investigated for heterogeneous catalysis due to its high surface area and its ability to facilitate high metal dispersion [5].

In this work, a series of Ni incorporated mesostructured silica nanoparticles (MSN) were prepared by physical mixing method. Electrolyzed nickel oxide was used as the Ni precursor. The structural properties of Ni/MSN catalysts were characterized by X-Ray diffraction (XRD) and N_2 physisorption. The catalytic properties of the catalysts were studied for the reforming of CH_4 with CO_2. The 10Ni/MSN catalyst showed the highest CH_4 and CO_2 conversion with 63.4% and 87.2 %, respectively. The results indicated that the presence a suitable amount of Ni in MSN was beneficial to achieve high catalytic activity. This behavior is closely related with both amount of active centers on the pore wall surface and the stabilized dispersion of the active sites by silica matrix. Thus, the Ni/MSN catalyst prepared by electrochemical method and physical mixing synthesis has a potential to be utilized in CO_2 reforming of CH_4.



Scheme 1 Proposed reaction route of CO_2 reforming of CH_4 over Ni/MSN

1. Lotina, A.S.; Daza, L. Appl. Catal. A-Gen. 2014, 474, 107.
2. Ibrahim, A.A.; Fakeeha, A.H.; Al-Fatesh, A.S. Int. J. Hydrogen Energ. 2014, 39, 1680.
3. Alipour, Z.; Rezaei, M.; Meshkani, F. Fuel 2014, 129, 197.
4. Wang, N.; Yu, X.; Wang, Y.; Chu, W.; Lu, M. Catal. Today 2013, 212, 98.
5. Aziz, M.A.A.; Jalil, A.A.; Triwahyono, S.; Mukhti, R.R.; Taufiq-Yap, Y.H.; Sazegar, M.R. Appl. Catal.B-Environ. 2014, 147, 359.

Mrs. Siti Munirah binti Sidik
Universiti Teknologi Malaysia, UTM Johor Bahru, Johor, Malaysia.
Phone: +61 3 7068003 , E-mail: smunirah_sidik@yahoo.com
Research interests: Solid Base Catalyst, Catalyst, Inorganic Chemistry

2007-2010 B.Eng.(Industrial Chemistry) Universiti Teknologi Malaysia,Malaysia
2010-2012 M.Eng (Chemistry) Universiti Teknologi Malaysia,Malaysia
2012-present PhD student at Universiti Teknologi Malaysia, Malaysia