

# Refluxed Synthesis of SBA-15 Using Sodium Silicate Extracted from Oil Palm Ash for Dry Reforming of Methane

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## ABSTRACT

The effects of Nickel (Ni) loading on Mesoporous Silica Barbara Amorphous (SBA-15) properties and catalytic activity with respect to dry reforming of methane were studied. The mesostructure characteristics of SBA-15 synthesized from oil palm ash (OPA) waste was proven by XRD low angle and N<sub>2</sub> adsorption-desorption isotherms. Ni/SBA-15 was prepared by the sol gel method that favours metal dispersion on the SBA-15 support. The properties of the catalysts were evaluated by XRD, BET, TEM, and FTIR. The catalytic activity of catalyst was investigated in a stainless steel fixed-bed reactor at 800°C with a 1:1 ratio of CO<sub>2</sub>:CH<sub>4</sub> feed composition. Ni supported on SBA-15 (OPA) exhibited higher CO<sub>2</sub> and CH<sub>4</sub> conversion with 61.07 % and 54.65 %, respectively compared to the Ni/SBA-15 (s.s) produced using commercial sodium silicate. This result demonstrated that smaller particle size of NiO with high dispersion on the SBA-15 surface, leads to higher syngas formation compared to Ni/SBA-15 (s.s). Furthermore, the appropriate interaction and synergistic effects of Ni-SBA-15, and greater NiO surface active sites were responsible for good activity in terms of CO<sub>2</sub> and CH<sub>4</sub> decomposition.

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**KEYWORDS:** OPA, POFA, CO<sub>2</sub> reforming, Ni/SBA-15, Silica source

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