

## **Non-thermal plasma catalytic dry reforming of methane over Ni-Co<sub>3</sub>O<sub>4</sub> supported modified-titania catalysts: Effect of process conditions on syngas production**

*Wednesday, 20 September 2023 15:20 (30 minutes)*

The dry reforming of methane has been studied over modified TiO<sub>2</sub>-supported 10%Ni-5%Co<sub>3</sub>O<sub>4</sub> composite catalysts using a non-thermal plasma dielectric barrier discharge fixed-bed reactor. The 10%Ni-Co<sub>3</sub>O<sub>4</sub>/modified-TiO<sub>2</sub> nanorods (NR) have been synthesized by hydrothermal method. Physicochemical characterizations of the composite catalysts have been conducted by X-ray diffraction (XRD), H<sub>2</sub> temperature-programmed reduction (H<sub>2</sub>-TPR), CO<sub>2</sub> temperature-programmed desorption (CO<sub>2</sub>-TPD), high-resolution transmission electron microscopy (HRTEM) and N<sub>2</sub> adsorption-desorption (BET) analysis. Incorporation of cubic-structured Co<sub>3</sub>O<sub>4</sub> into Ni/TiO<sub>2</sub> attributes to the enhancement of basicity, reducibility and metal-support interaction. Consequently, the catalytic activity of 10%Ni-5%Co<sub>3</sub>O<sub>4</sub>/TiO<sub>2</sub> NR increases and confer CH<sub>4</sub> and CO<sub>2</sub> conversions at 86.4% and 84.9%, respectively. Meanwhile, the H<sub>2</sub> and CO selectivity are reported as 50.1% and 49.0% respectively. Higher syngas ratio (H<sub>2</sub>/CO) from 0.84 to 1.01 and 26% increment in overall energy efficiency compared to plasma DRM alone have been observed. The superior plasma DRM performance is correlated to the greater basicity properties and the synergistic effect of non-thermal plasma with the 10%Ni-5%Co<sub>3</sub>O<sub>4</sub>/modified-TiO<sub>2</sub> catalyst composite.

### **Speaker's Affiliation**

Universiti Teknologi Malaysia, Johor Bahru

### **Member State or IGO/NGO**

Johor

**Primary author:** SAIDINA AMIN, Nor Aishah (Universiti Teknologi Malaysia)

**Co-authors:** Mr ABBAS, Tariq (Universiti Teknologi Malaysia); Mrs MOHIDIN, Hamdya Sabrina (Universiti Teknologi Malaysia)

**Presenter:** SAIDINA AMIN, Nor Aishah (Universiti Teknologi Malaysia)

**Session Classification:** Catalysis

**Track Classification:** Atmospheric Pressure Plasma