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NiO-Impregnated SiC and Al_2O_3 Ceramic Foams as Structured Catalysts for Methane Steam Bi-Reforming

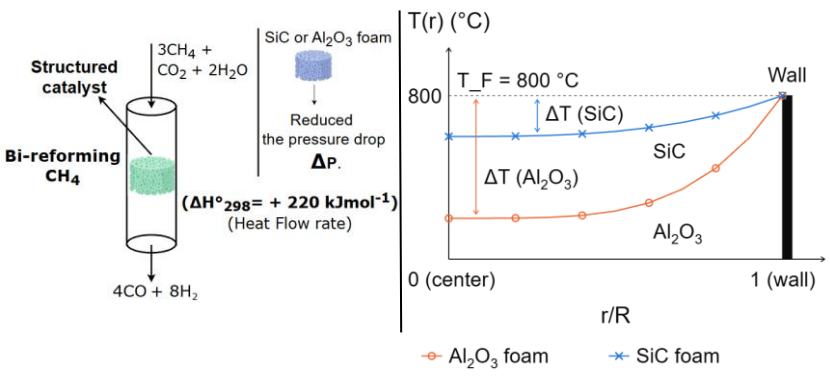
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Introduction



(KUMAR; SHOJAEE; SPIVEY, 2015).

Objectives

To investigate the physicochemical properties of nickel-based structured catalysts supported on Al_2O_3 and SiC foam, aiming at their application in the methane bi-reforming process.

Methodology

Production of foam and catalysts

Ceramic replication → Wet impregnation

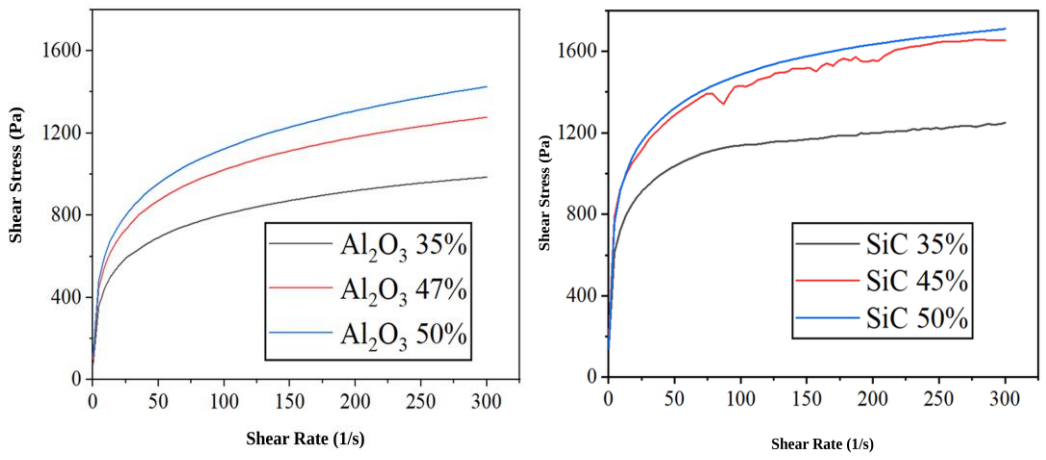
Figure 1. Bi-reforming of CH_4 experimental setup



*Temperature = 800 °C
and CH_4:H_2O:CO_2 Ratio = 1:3:0.33

Results and Discussion

Figure 2. Rheology



- Pseudoplastic behavior, with the highest shear stress at 50% solids content.

Figure 3. X-ray Diffraction (XRD)

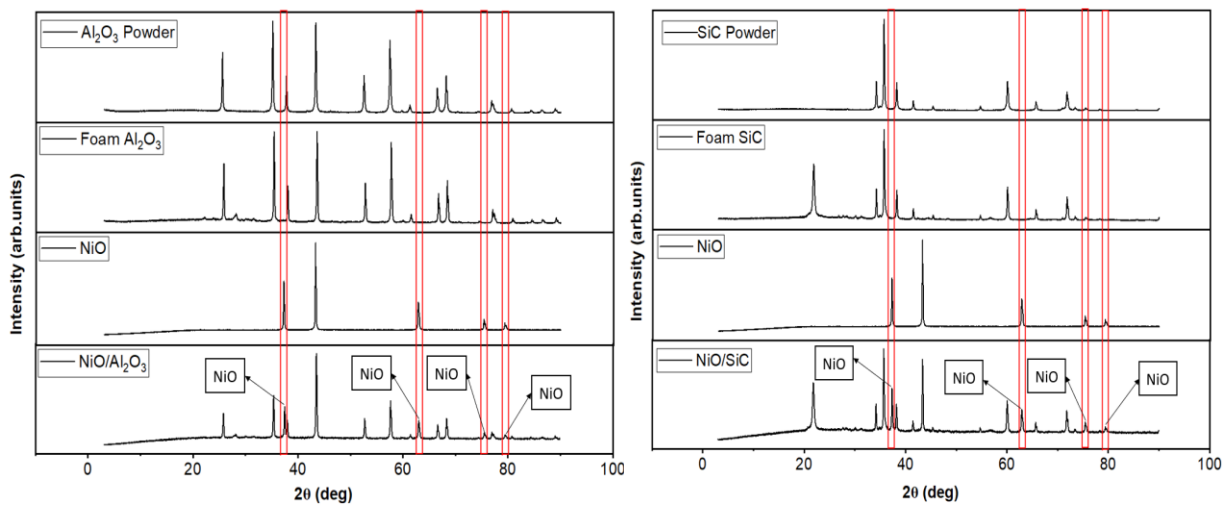


Figure 4. SEM and EDS

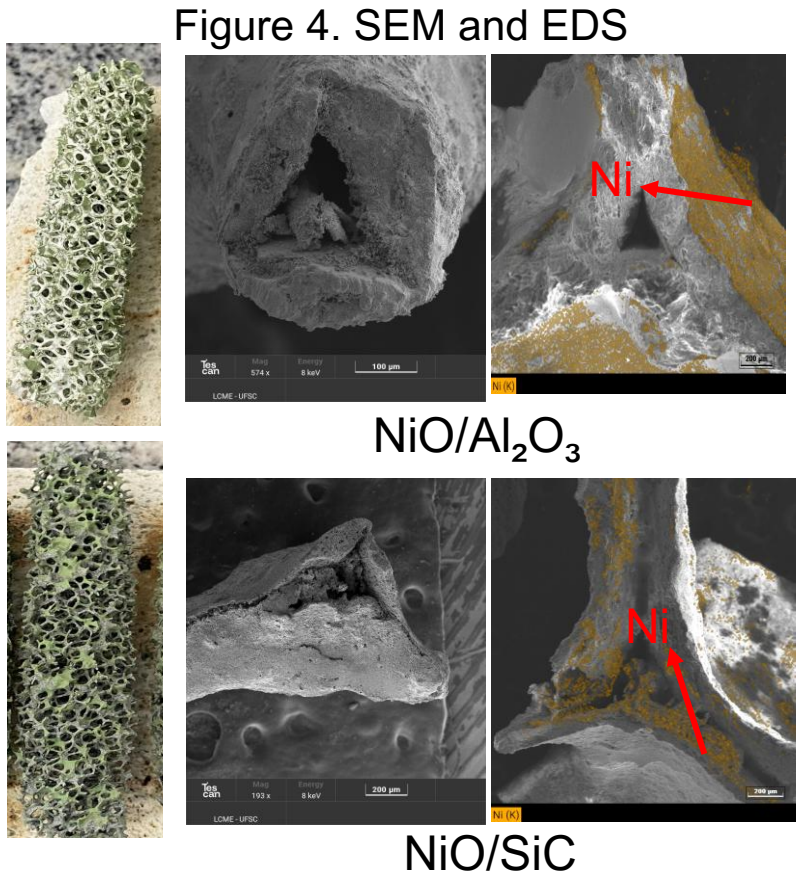


Figure 5. Thermal Conductivity of the Foams

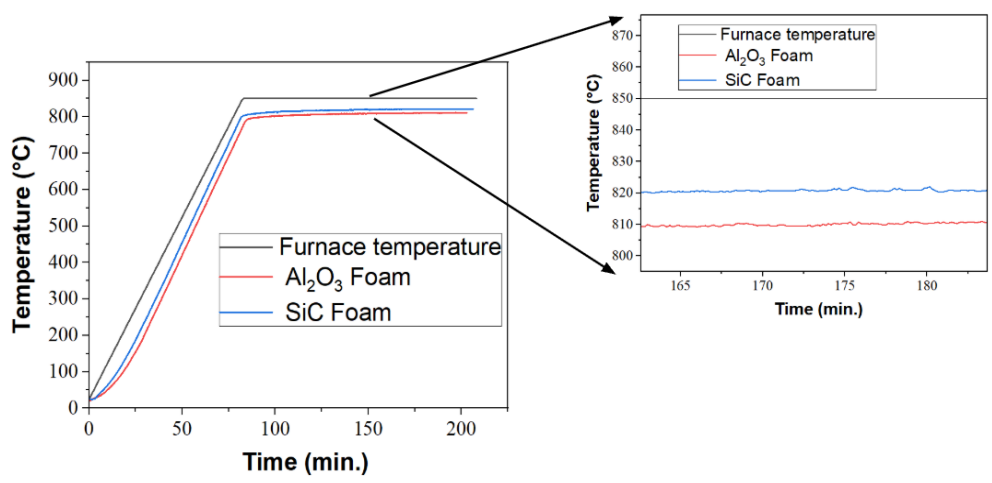


Table 1. Bi-reforming CH_4

Catalyst	Conversion CH_4 (%)	Conversion CO_2 (%)	H_2 Yield (mol/mol)	CO Yield (mol/mol)
NiO(18%)/Al_2O_3	15	31	0.81	0.016
NiO(18%)/SiC	16	23	0.23	0.30

Conclusions

- NiO was successfully deposited on both supports, Al_2O_3 and SiC.
- NiO/Al_2O_3 gave higher CO_2 conversion and H_2 yield.
- NiO/SiC gave higher CO yield.

References and Acknowledgments

N. Kumar; M. Shojaee; J. J. Spivey. Current Opinion in Chemical Engineering. 2015, 9, 8–15.

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