Highlighting a Ceria-Enhanced Nickel Catalyst for Efficient Low-Temperature Methanation

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Abstract

Rising levels of atmospheric carbon dioxide (CO_2) are prompting significant environmental concerns and are driving the scientific community to develop innovative mitigation strategies. A promising approach involves the use of residual CO_2 as a carbon source for producing value-added chemicals and fuels.[1] The methanation reaction (also known as Sabatier reaction), which allows the formation of methane (CH_4) and water *via* metal-catalysed CO_2 reduction, shows great potential for advancing carbon recycling and renewable energy storage.[2-4] In this contribution, we present a nickel-based catalyst, enhanced with ceria and supported on γ–θ-Al_2O_3, that exhibits great low-temperature performance (80% CO_2 conversion and >99% methane selectivity) even when operating at 250 ºC and atmospheric pressure. Through DoE, we explored the influence of nickel content, support material, reaction temperature and GSHV, thereby identifying the parameters with the greatest impact on CO_2 methanation. Subsequently, we investigated our catalyst's behaviour using a series of experimental characterizations.

References

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