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Effect of CaO Addition on Nickel Catalysts Supported on Alumina for Glycerol Steam Reforming

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Abstract

Hydrogen production by glycerol steam reforming is an attractive alternative, as it represents the conversion of a waste in a high-added value product. In this work, three catalysts were synthesized by wet impregnation of nickel precursor in different supports: γ-Al_2O_3 prepared by boehmite calcination, α-Al_2O_3 and 15 wt% CaO-γ-Al_2O_3 prepared by wet impregnation of calcium oxide precursor in γ-Al_2O_3. A commercial catalyst for methane steam reforming was also evaluated. Catalytic tests were performed at 500 °C, glycerol feed of 20% v/v and GHSV of 200,000 h^{-1}. The calcium oxide incorporation reduced the formation of nickel aluminate phase ($NiAl_2O_4$) and the amount and strength of catalyst acidity, while increasing the amount and strength of basic sites. Furthermore, it was the only catalyst that has not presented deactivation in 30 h of reaction, showing the highest glycerol conversion and hydrogen yield after 24 h of reaction. Ni/γ-Al_2O_3 and Ni/α-Al_2O_3 presented a severe deactivation, which was associated with coke formation. The synthesized catalysts presented better catalytic performance for glycerol steam reforming in comparison with commercial catalyst, in terms of higher glycerol conversion, glycerol conversion to gas and hydrogen yield.

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