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Effect of Doping Niobia over Ni/Al_2O_3 Catalysts for Methane Steam Reforming

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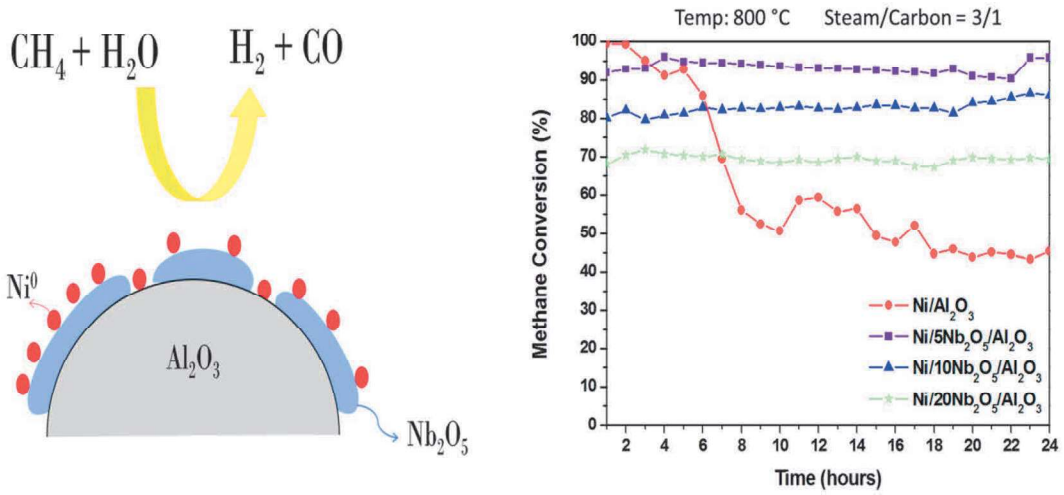
Abstract

The addition of niobia to nickel/alumina catalysts was evaluated for methane steam reforming, correlating with structural, textural and acid/base properties. The catalysts containing 5–10 wt% Nb_2O_5 presented higher methane conversion at 800 °C and did not deactivate during 24 h on stream, while coke formation was inhibited on the catalyst with 20 wt% Nb_2O_5.

Graphical Abstract



Keywords Methane · Steam reforming · Nickel · Alumina · Niobia

1 Introduction

Currently, the world is facing serious environmental problems such as global warming, greenhouse effect, increase of the ozone hole and thermal inversion. Furthermore, there is the concern about the depletion of nonrenewable resources in the near future. Considering these problems, it is primordial to diversify the energy matrix. Today, energy is already produced through sunlight, wind, water power in hydroelectric and even biomass, but not enough to totally replace fossil fuels such as oil, coal and natural gas.

A very interesting alternative that has been considered as future energy source is hydrogen, due to its production flexibility, high energy density per unit mass, large amount of energy released during its burning and non-toxicity. In addition to the energetic use, hydrogen is employed in the synthesis of various products, such as ammonia and methanol, and in various chemical processes, like hydrocracking, hydrotreating, etc [1, 2]. However, as hydrogen has quite low volumetric energy density, its storage and transportation

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