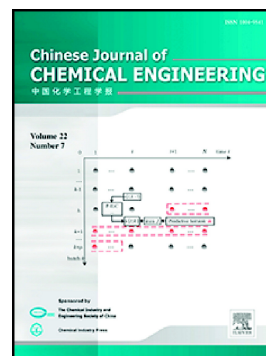


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Bi-metallic catalysts of mesoporous Al₂O₃ supported on Fe, Ni and Mn for Methane decomposition: Effect of activation temperature**Anis H. Fakeeha¹, Ahmed S. Al-Fatesh^{*1}, Biswajit Chowdhury², Ahmed A. Ibrahim^{1*}, Wasim U. Khan¹, Shahid Hassan², Kasim Sasudeen and Ahmed Elhag Abasaheed¹**¹Chemical Engineering Department, College of Engineering, King Saud University P.O. Box 800, Riyadh 11421, Kingdom of Saudi Arabia.²Department of Applied Chemistry, Indian School of Mines, Dhanbad, India.^{*}Corresponding authors. Tel 009661-4676859 Fax 009661-4678770 Email addresses: aidid @ ksu.edu.sa,

aalfatesh@ksu.edu.sa

A b s t r a c t

Methane decomposition reaction has been studied at three different activation temperatures (500°C, 800°C and 950°C) over mesoporous alumina supported Ni-Fe and Mn-Fe based bimetallic catalysts. On co-impregnation of Ni on Fe/Al₂O₃ the activity of the catalyst was retained even at the high activation temperature at 950°C and up to 180 min. The Ni promotion enhanced the reducibility of Fe/Al₂O₃ oxides showing higher catalytic activity with a hydrogen yield of 69%. The reactivity of bimetallic Mn and Fe over Al₂O₃ catalyst decreased at 800°C and 950°C activation temperatures. Regeneration studies revealed that the catalyst could be effectively recycled up to 9 times. The addition of O₂ (1 ml, 2 ml, 4 ml) in the feed enhanced substantially CH₄ conversion, the yield of hydrogen and the stability of the catalyst.

Keywords: Carbon nanotube, Hydrogen production, Methane decomposition, manganese promoter, Nickel promoter

1. Introduction

The declining nature of non-renewable fossil fuels and global warming stimulated the fundamental research in promoting better energy options with low emission, and therefore renewable alternative energy sources are gaining considerable attention [1]. In the recent era, hydrogen is emerging as one

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