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Polyaniline-supported iron catalyst for selective synthesis of lower olefins from syngas

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Abstract

Uniform iron nanoparticles dispersed on polyaniline have been used as catalysts for the direct conversion of synthesis gas into lower olefins. As compared to active carbon and N-doped active carbon, polyaniline as a support of Fe catalysts showed higher selectivity of lower olefins (C_{2-4}). The C_{2-4} selectivity reached ~50% at a CO conversion of 79% over a 10 wt% Fe/polyaniline catalyst without any promoters. The XRD, H_2 -TPR, TEM and HRTEM studies revealed that the presence of nitrogen-containing groups in polyaniline structure could promote the dispersion and reduction of iron oxides, forming higher fraction of iron carbides with smaller mean sizes and narrower size distributions. The propylene-TPD result indicates that the use of polyaniline support facilitates the desorption of lower olefins, thus suppressing the consecutive hydrogenation to form undesirable lower paraffins.

Keywords: Polyaniline; Iron catalyst; Lower olefins; Fischer-Tropsch; Electron effect

1. Introduction

Lower olefins (ethylene, propylene, and butenes) are key building blocks in the chemical industry. They are mainly produced from steam cracking of naphtha [1]. A lot of efforts have been made to develop alternative processes to synthesize lower olefins from non-petroleum

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