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Investigation of CO_2 to CH_3OH Conversion Process over NiGa/mesosilica Catalyst

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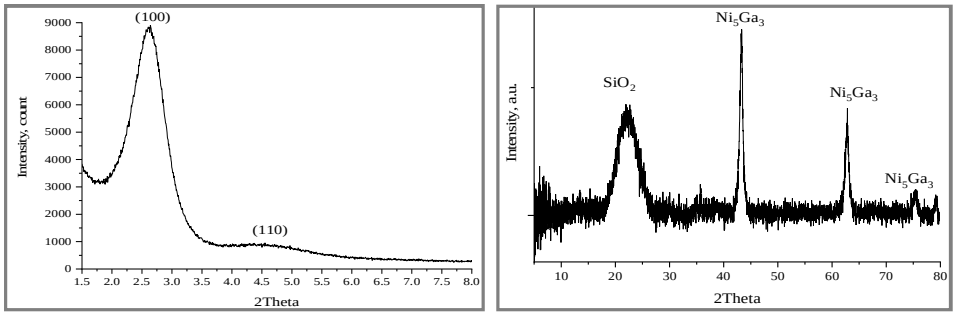
ABSTRACT

In this study, investigations of CO_2 to CH_3OH conversion over NiGa/mesosilica catalyst were established for determining a set of suitable parameters applied in the process. There were four parameters which were considered including effects of temperature, time, pressure and H_2/CO_2 volume ratio. The novel NiGa/mesosilica catalyst prepared and characterized in elsewhere study possessed high surface area, ordered mesoporous structure and high active sites of Ni_5Ga_3 which considerably improved the performance of this reaction. The results exhibited an excellent activity and stability of the NiGa/mesosilica catalyst compared to many other studied catalysts, and the high yield of CH_3OH opened a novel and effective way of direct conversion of CO_2 to utilizable products. The Gas Chromatography coupled with Thermal Conductivity Detector (TCD) and Flame Ionization Detector (FID) was applied for analyzing the gas products composition.

Graphical Abstract



XRD patterns of NiGa/mesosilica catalyst

Highlights

- Preparing and characterizing NiGa/mesosilica catalyst: the catalyst possessed high surface area, ordered mesoporous structure and high active sites of Ni_5Ga_3 which considerably improved the performance of this reaction;
- Investigating conversion of CO_2 to CH_3OH in continuous flow system: the results exhibited an excellent activity and stability of the catalyst through the high yield of CH_3OH.

Keywords: **M**ethanol economy, Carbon dioxide reduction, NiGa based catalyst, Mesoporous materials.