SYNGAS PRODUCTION THROUGH STEAM AND CO_2 REFORMING OF METHANE OVER NI-BASED CATALYST-TECHNICAL REVIEW

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Abstract:

CH_4 and CO_2 are the two most abundant greenhouse gas emissions which are responsible for global warming. Therefore, the reduction of their emissions and proper utilization has become the most significant challenge in the field of green energy researches. Reforming of methane with steam and carbon dioxide is one of the feasible solutions to convert the primary sources of greenhouse gases into syngas (CO and H_2). Nowadays, syngas is an essential resource for many industrial applications to produce beneficial value-added products. Besides, it has been referred to as a transition fuel from the carbon-based fossil fuel towards pure hydrogen energy in the stationary internal combustion engines. Reforming of methane with steam or CO_2 occurs as a result of the reaction between methane and steam or CO_2 at high temperature in the presence of a catalyst. Therefore, reaction routes need to be controlled to achieve the desired outputs. In order to control the reaction path, there are several parameters need to be technically optimized like thermodynamic analysis to determine the preferred temperature, pressure and feed concentrations ratios. Reaction kinetic is also necessary to find the reaction rate and select the convenience type of catalyst that can enhance the reaction rate. Catalyst selection and preparation are essential in the reaction because they contribute to the reaction outputs mainly of the syngas ratio (H_2/CO). This manuscript is intended to observe the trend of technology improvements on thermodynamic analysis and kinetic study of steam and CO_2 reforming of methane reactions over the Ni-based catalyst. It also presents the evaluation of the catalytic properties and their correlation with the performance of the catalyst needed for catalyst design and suitable for steam and dry reforming of methane reactions.

Keywords: Syngas; reforming; methane reforming; Ni-based catalyst.

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