**Thermo-catalytic conversion of CO2 into ethanol over Na-Co/ZnO &Na-Co/SiO2 catalyst.**

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**Abstract**

Ethanol is a significantly useful chemical in both industry and our daily life as it has been widely used as a clean fuel additive, solvent, and disinfectant. Its production mainly depends on the fermentation process and as fermentation process is a slow batch process which inhibits its application for large scale production. Therefore, developing new routes for ethanol production is of great importance. Production of ethanol using CO2 as the feedstock has its own merits. As CO2 is a major contributor of greenhouse gases, conversion of CO2 into value added product such as ethanol will not only result in production of alternative fuel but it will also help in reduction of CO2 emission. Thermo-catalytic conversion of CO2 into ethanol can offer an attractive solution for continuous and large-scale ethanol production. Previous studies have shown that the major challenges of this thermos-catalytic process are low CO2 conversion and ethanol selectivity.

In this current work, Na-promoted cobalt-based catalysts supported on different support i.e ZnO, and SiO2 has been investigated. For this purpose 2% Na-20%Co/ZnO Catalyst is prepared by incipient wetness impregnation method using 0.37 gm Na2CO3, 3.96 gm of Co(NO3)2.6H2O, and rest 3.12 gm of ZnO [1]. SEM-EDX results further verified the above constituents in the catalyst. Catalyst prepared was calcined at 350oC for 3h. Before activity test, catalyst was activated at 350oC and 5 bar conditions with a flow of 31.1 ml/min hydrogen gas. H2 and CO2 ratio is maintained as 3:1. Activity test of prepared catalyst was performed at 250oC and 15 bar pressure condition and feed flow of 62.2 ml/min. Figure 1 shows the preliminary investigation for Na-Co/ZnO catalyst. It was found that CO2 conversion was lying between 30-45%. However, no ethanol production was observed. Currently investigations are underway to find the cause of high CO2 conversion with low ethanol selectivity. To further investigate the effect of support, activity test of Na-Co/SiO2 will also be performed. To understand the relationship between catalyst activity and its physicochemical properties, a detailed catalyst characterization studies are currently going on.

**Figure1**- CO2 conversion percentage with time on stream for Na-Co/ZnO (T-250oC, P-15 bar, CO2:H2= 3:1)

**Keywords:** Ethanol, CO2 hydrogenation, Cobalt catalyst, Carbon utilization.

**References: [1] S. Zhang,** X. Lui, Z. Shao, H. Wang, Y. Sun., J.Catal., Volume 382 (2020) 86-96