Effect of Calcination Temperature on Hydrogen Production via Ethanol Dry Reforming Over Ni/Al_2O_3 Catalyst

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***Abstract*— Ni/Al_2O_3 catalysts were prepared by the wet-impregnation method and calcined at different temperatures (500°C, 600°C and 700°C) to obtain NiAl-1, NiAl-2 and NiAl-3 respectively. NiAl-1, NiAl-2, NiAl-3 represent catalysts calcined at 500°C, 600°C and 700°C respectively. The catalysts were characterized using different techniques, XRD, BET and TGA. XRD results revealed the presence of NiO phase on all the catalysts during calcination, however, the presence of spinel, $NiAl_2O_4$, was more pronounced on the catalyst calcined at 600°C (i.e. NiAl-2), indicating the existence of strong metal-support interaction. BET results showed that NiAl-1 has the highest surface area of about 190cm^2/g. All the catalysts were tested for ethanol dry reforming in a tubular stainless steel fixed-bed reactor at 700°C and CO_2/ethanol ratio of 3 under atmospheric pressure and were evaluated in terms of reactants conversion and selectivity of H_2 to see the effect of the different calcination temperatures on the catalysts' activities. Ethanol conversion was 100% for all the three catalysts and NiAl-2 has the highest CO_2 conversion with an average value of about 57%. The three catalysts have almost the same performance in terms of H_2 selectivity. The presence of multi-walled carbon nanofibers (MWCNFs) were confirmed on all the catalysts as revealed by the TGA result. The catalyst calcined at 600°C (i.e. NiAl-2) displayed the best relative catalytic activity**

***Index Terms*—Ethanol, XRD, BET, TGA, Carbon dioxide, wet-impregnation, calcination, spinel, MWCNFs**

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