

Investigation of alumina supported mixed nickel oxide and cerium oxide catalysts for syngas production

ABSTRACT

Catalysts containing mixtures of nickel oxide and cerium oxide with different ratio, 1:1, 1:2 and 2:1 were prepared by the sonochemical treatment. The sonication was prolonged for 45 min, constant for each of the catalyst prepared supported by alumina. The resultant catalysts were characterized using X-ray diffraction, scanning electron microscope, energy dispersive X-ray spectroscopy and temperature programmed reduction (TPR) in H₂. The syngas production was detected using temperature programmed gasification and it was done under 5 % oxygen in helium. The coconut shell in powder form (3 μm) was used as a feedstock. X-ray diffraction patterns shows that all of the catalyst was perfectly matched to the XRD patterns standard of NiO, CeO₂ and alumina, indicating that the catalyst produce through this method were in high purity. Energy dispersive X-ray spectroscopy results further confirmed that all of the elements contain inside the synthesized catalyst were NiO, CeO₂ and alumina were produced in each catalyst. 1:1 ratio of catalyst shows the highest syngas production (H₂/CO) with ratio 0.76 followed by 1:2 and 2:1 with 0.62 and 0.44, respectively. Compared to the standard optimum ratio of syngas which is equal to 1, the experimental value which is 0.76 (nearer to 1), so that it can be used for production of acetic acid and acetyl oxide.

Keyword: Syngas production; Biomass gasification; Mixed nickel oxide; Cerium catalyst