

Facile recoverable and reusable macroscopic alumina supported Ni-based catalyst for efficient hydrogen production

ABSTRACT

A γ -NA5 catalyst in the form of pellet was first to be reported and was pioneering in gasification to accelerate the production of syngas through biomass (palm empty fruit bunch) conversion. The synthesised γ -NA5 pellet possesses a high surface area of $212.32 \text{ m}^2\text{g}^{-1}$, which renders more active sites for hydrocarbon cracking, subsequently leading to high H_2 production ($0.0716 \text{ m}^3 \text{ kg}^{-1}$). Additionally, the pellet exhibits remarkable reversibility and reusability with 91% H_2 production efficiency being retained after five consecutive gasification cycles. Distinctively, the feature of the synthesised γ -NA5 pellet from the conventional powder-like catalyst is that it eases the separation of the used catalyst from the biomass ash, and subsequently facilitates regeneration solely by calcination process. The loading of 20 wt.% optimised amount of catalyst itself has successfully shortened the completion of gasification process up to 135min, which is highly feasible for a large-scale industrial usage after considering the cost of the catalyst, facile preparation method, and catalyst's effectiveness towards gasification.