

Carbon monoxide reduction in the flue gas during biochar production from oil palm empty fruit bunch

ABSTRACT

Biomass carbonization technology is implemented to produce charcoal with high-calorific content. However, this technology releases pollutant gases, which adversely affect ambient environment and human health. This study proposed a catalytic gas treatment method using platinum-supported alumina catalyst (Pt/ γ -Al₂O₃) for carbon monoxide emission reduction in oil palm empty fruit bunch carbonization. Carbonization released a rather high carbon monoxide concentration of 5558 ± 53 mg m⁻³ in the flue gas, exceeding the permissible limit of 1000 mg m⁻³. At 2.5 wt% of catalyst dosage, the carbon monoxide emission substantially was reduced to 595 ± 9 mg m⁻³, achieving 89.3% carbon monoxide removal efficiency. This was due to oxidation by the platinum-supported alumina catalyst (Pt/ γ -Al₂O₃), which was done at low temperature, thus transforming carbon monoxide into carbon dioxide. The catalyst demonstrated reusability, attaining >80% carbon monoxide removal efficiency for 5 consecutive carbonization cycles. The biochar produced contained a high energy content of 24.6 ± 0.7 MJ kg⁻¹, which was suitable to be used as a coal substitute.

Keyword: Carbonization; Biochar; Carbon monoxide emission; Oil palm empty fruit bunch