

ABSTRACT

Indonesia's fossil fuel supply is dwindling, with oil reserves expected to run out within the next three decades. Therefore, biomass offers significant potential as an alternative to reduce dependence on fossil fuels. However, biomass utilization is still not optimal due to its low conversion efficiency and the high emissions generated by the conversion process. This research aims to address this challenge by developing an environmentally friendly hydrogen production method using local biomass.

The proposed solution is an updraft-type gasification reactor using coconut shell charcoal as the raw material, equipped with a control system. The innovations include the use of a medical infusion set as a water supply, air flow control with a blower, and real-time temperature monitoring using a K-type thermocouple sensor connected to an Arduino Uno. The reactor design also includes a filter to remove particles and a copper pipe cooling system to ensure gas measurements.

Simulation results demonstrate 83.40% mass conversion efficiency with 0.528L hydrogen at 800°C. Preliminary tests confirm thermal stability ($\pm 15^{\circ}\text{C}$) during 60-minute operations. Thus, coconut shell charcoal proves viable for sustainable hydrogen production, though tar reduction optimization requires further study.

Keywords: Biomass gasification, Renewable hydrogen, Coconut shell charcoal, Updraft reactor