**Abstract**

The thermal decomposition of palm oil wastes in the form of palm shell and palm oil fronds in the presence of steam and catalyst was experimentally investigated using thermogravimetric analyzer-gas chromatography (TGA-GC). The hydrogen gas composition was observed for palm oil wastes thermal decomposition i) under inert atmosphere (no steam), ii) in steam gasification and iii) in catalytic steam gasification using a newly developed bi metallic catalyst. Detailed discussion has been made for product gas composition profiles at steam-to-biomass ratio of 1 and biomass-to-catalyst ratio of 3. Maximum H2 content up to 64 mol% and 50 mol% in product gas was observed for palm shell and palm oil fronds, respectively, in the catalytic steam gasification. The usage of steam has almost increased H2 content by 28% for both palm oil wastes. The catalyst usage in the steam gasification increased H2 content by 12.5% and 6% for palm shell and palm oil fronds, respectively. Moreover, CO2 concentration in the product gas was reduced in steam gasification where CO concentration was decreased in catalytic steam gasification. This decrease in CO concentration is due to the bi metallic catalyst activity on water gas shift reaction.