

ABSTRACT

A method and an apparatus for low-temperature biomass pyrolysis and high-temperature biomass gasification. The method uses a super-heated water vapor as an oxidizer and an energy carrier. First, the biomass is subjected to a low-temperature pyrolysis at a temperature between 500 and 800°C. Next, a crude synthetic gas and coke thus obtained are subjected to a high-temperature gasification at a temperature between 1200 and 1600°C to obtain a tar-free synthetic gas. Finally, the synthetic gas generated is subjected to a sequence of cooling, dust removal, acid removal, and dehydration processes. The apparatus consists essentially of a pyrolysis furnace (5), a gasification furnace (9), a low-temperature plasma torch heater (8), a high-temperature plasma torch heater (10), a water storage container (17), a water delivery pump (16), and a heat exchanger (11).