

ABSTRACT

A microwave plasma biomass gasifying fixed bed gasifier comprising a vertically arranged gasifier body (2). The upper part of the gasifier body (2) is a gasifier clearance area (8). The lowest part of the gasifier body (2) is a fixed bed layer. Provided on the gasifier body are a raw material and fuel inlet, a product gas outlet, an oxygen/steam inlet (4 and 5). Provided at the bottom part of the gasifier body is a slug discharging outlet (7). Arranged at the product gas outlet is a synthesis gas monitoring unit (6). Arranged on the gasifier body is at least one section of microwave plasma generator (3). Also provided is a biomass gasification process utilizing the gasifier. The process comprises: 1) a biomass is fed into the gasifier via a feeder apparatus, and gasified on the microwave plasma fixed bed layer; a biomass fixed carbon content is subjected to a combustion reaction in an oxidation area on the bed layer, a high temperature flue gas is generated, the flue gas is transmitted upwards to a feeder area to heat a fuel fed into the gasifier, while at the same time, is subjected to a chemical reaction with high temperature steam injected from the lower layer oxygen/steam nozzle and an activity-rich microwave plasma-activated oxidizer of a first-section microwave plasma generator, where the temperature of a reaction area is controlled between 700°C and 1600°C; 2) a synthesis gas generated from the reaction is transmitted upwards to the clearance area, and is further cracked via a second-section microwave plasma generator; 3) a residual coke substance is transmitted downwards to the fixed bed layer to gradually release heat to maintain bed temperature, a burned biomass slag is discharged outside the gasifier via the slag discharging outlet; and 4) online monitoring is implemented via the synthesis gas monitoring unit arranged at the product gas outlet at the top part of the gasifier.