SELF-SUSTAINED SINGLE-STEP ACTIVATION IN SITU PROCESS FOR ACTIVATED CARBON SYNTHESIS FROM AGRO-RESIDUES

IITM Technology Available for Licensing

Problem Statement

- In the production of activated carbon from coconut shells, the traditional two-step process involving charcoal production and activated carbon production has inefficiencies and environmental issues.
- During charcoal production, the rate of air supply is not monitored, leading to inconsistent burning rates and charcoal yields that depend on labor skill.
- **Water quenching of the charcoal results in the loss of heat energy**, and combustible gases are released into the atmosphere without being utilized, causing energy waste and air pollution.
- In the activated carbon production stage, the process relies on fossil fuels (diesel/electricity) for steam generation, contributing to environmental concerns and potentially higher production costs.

Intellectual Property

- IITM IDF Ref. **1892**
- **IN 389137 - Patent Granted**
- **PCT/IN2020/050732**

Technology Category/ Market

Category - Biomass Conversion
Applications- Biomass Conversion and Sustainable Energy
Industry- Renewable Energy, Environmental Engineering, Biomass Processing.

Market - Global activated carbon market size grew from $5.45 billion in 2022 to $6.21 billion in 2023 at **a CAGR of 13.9%.**

TRL (Technology Readiness Level)

TRL - 4: Technology validated in lab scale.

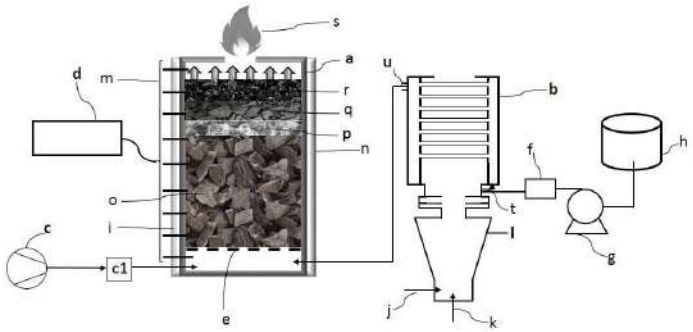

FIG. 1. illustrates a batch type system for the production of activated carbon.

Technology

- The present invention relates to **biomass processing, specifically focusing on self-sustained single-step activation** for synthesizing activated carbon from agro residues through combustion techniques.

The invention teaches production of activated carbon (AC) in a single step by physical activation using steam as the activation agent and ligno-cellulosic biomass as the precursor.

The AC is produced in a continuous process in a fixed bed reactor directly from coconut shells without it being converted to charcoal and without using any external heat source. This is a self-sustainable process where in the heat energy required for activation process (endothermic reaction) is provided by partial oxidation of volatiles (exothermic reaction).

And, the heat energy required for steam generation is provided by combustion of by product producer gas, thus making the process self-sustainable.

Research Lab

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Industrial Consultancy & Sponsored Research (IC&SR)

Key Features / Value Proposition

Cost-Efficiency
- The technology allows for the direct production of activated carbon from ligno-cellulosic biomass, such as coconut shells, without the intermediate step of charcoal conversion. This streamlined process

Pollution-Free
- The process is designed to minimize environmental impact by utilizing a limited supply of air for partial oxidation and by generating the required heat through the exothermic reaction of volatiles.

Continuous Operation
- The system is capable of continuous production, making it suitable for industrial-scale applications

Energy Efficiency
- The process incorporates the use of by-product producer gas for steam generation, which significantly enhances energy efficiency and sustainability.

Quality Control
- The system can consistently produce high-quality activated carbon with a specified quality of 1100mg/gm, ensuring reliability and consistency.

Scalability
- The technology is scalable and not dependent on the scale of operation, making it adaptable for various production capacities while maintaining product quality and efficiency.

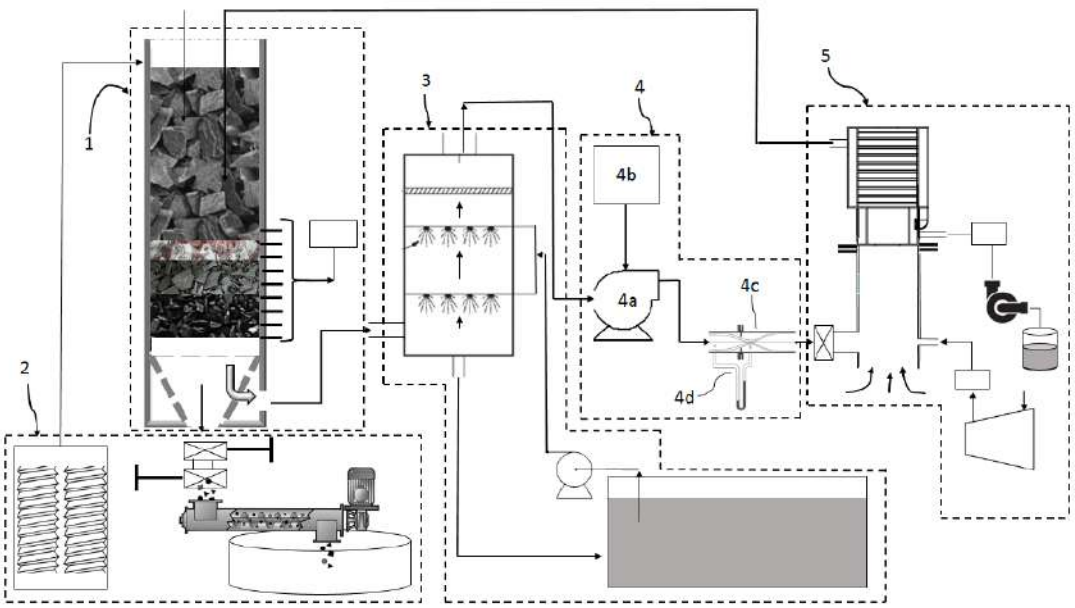

FIG. 2. illustrates a self-sustained single-step activation in situ process for activated carbon synthesis from agro residues.

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