

# **Environmental Benefits of Producing Adsorbent Materials from Unburned Carbon**

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**KEYWORDS:** unburned carbon, environmental benefits, adsorbent materials.

## **ABSTRACT**

The present global consumption of activated carbons is over 350,000 tons and it is estimated to rise 7% annually. The main reason for this expanding market is the ubiquitous use of activated carbons as adsorbent materials in a broad range of increasing applications, such as gas-phase adsorption in household air conditioning equipment and industrial emissions control, to liquid-phase adsorption for water treatment and even gold recovery. Therefore, due to the expanding market for activated carbons, especially in applications related to environmental protection, such as air and water purification, new precursors are being sought. The unburned carbon has a great potential as precursor for the production of activated carbons, since compared to the conventional two-step process that includes a devolatilization of the raw materials, followed by an activation step, unburned carbon only requires a one-step activation process, since it has already gone through a devolatilization process while in the combustor. Therefore, the use of unburned carbon as precursor for the production of activated carbons can bring enormous economical and environmental benefits to the coal, utility and carbon industries. Accordingly, this work addresses the potential use of unburned carbon from coal combustion as precursor for the production of adsorbent carbons. Steam and chemical activation of the unburned carbon can tailor its inherent mesoporosity into the desired porosity for a specific application and surface areas as high as 750 m<sup>2</sup>/g were achieved after only 2 hours steam activation. This paper evaluates and compares several routes for the production of adsorbent materials from unburned carbon, and also assesses the economical and environmental benefits of using the resultant activated carbons produced.