Utilization of Unburned Carbon as a Low Sulfur Alternative to Petroleum Coke

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ABSTRACT

Although several technologies have been successfully developed to separate the unburned carbon from the fly ash, only a few power plants have installed a beneficiation process on their sites. This is due to the low value of the resultant separated materials, since a ton of fly ash is generally sold for as little as $10-20, and the unburned carbon is simply disposed or rerouted to the combustor. However, the economics of this process will be greatly enhanced if the unburned carbon can be used as precursor for high-value premium carbon products. In fact, the nature of the unburned carbon is similar to that of calcined petroleum coke, selling for $ 220-250/ton, that is currently used for the manufacture of carbon bodies, that are used for a wide range of applications including anodes for aluminum smelting and electrodes for steel arc furnaces. However, the sulfur content in calcined petroleum coke is reaching alarmingly high levels, typically in the range 2-4%, while unburned carbon generally contains less than 0.5% sulfur. Accordingly, this paper investigates the potential use of unburned carbon as a low sulfur replacement for calcined petroleum coke for the production of carbon artifacts.

Carbon bodies were produced from mixtures of unburned carbon, sponge and needle petroleum coke, and a coal tar binder pitch. The baking yields were very similar for all the carbon bodies investigated, around 90%, as expected from the similar thermal history of petroleum coke and unburned carbon. The densities of the green and baked carbon bodies produced with only petroleum coke were slightly higher than those of the carbon bodies prepared using unburned carbon. Other properties are also being studied to determine the commercial use of the carbon bodies produced.