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PAH POLLUTION CONTROL TECHNOLOGY

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EXTENDED ABSTRACT

The aim of this paper is to study the abatement of three-ring PAHs (Polycyclic Aromatic Hydrocarbons) from hot gas emissions during energy generation in coal combustion. The performance of sixteen carbonaceous materials with different characteristics on PAHs adsorption at pipe temperature, 150 ºC, was studied.

The three-ring PAH are one of the most abundant PAHs groups emitted during coal combustion. Four of them —Acenaphthene (Ac), Phenanthrene (Phe), Fluorene (Fu) and Anthracene (An)— have been listed by U.S. EPA as priority pollutants. Therefore, due to the increasing concern to improve the air quality and the expected more restrictive legislations in the field of organic compound emissions, new PAH pollution control technologies will have to be developed and investigated. In this way, adsorption technology by carbonaceous materials is a promising alternative.

The three-ring PAHs adsorption capacities of several carbonaceous materials were related to their morphological and chemical surface properties. The morphological parameter studied were: narrow micropore volume, total micropore volume, mesopore volume and micropore size distribution; and the chemical surface properties were: acid, neutral and basic surface groups calculated from the CO and CO_2 released during thermal programmed desorption experiments. Single and multiple linear regression — principal component regression (PCR)— were applied in this study. The main conclusions reached were:

1. Microporosity seems to be the most important factor in the adsorption process because adsorption takes place mainly in those pores due to their higher adsorption potential.
2. Mesoporosity is also important because, not only mesopores drive the adsorbate molecules to the micropores but also they promote the multilayer interactions of low volatile PAHs, increasing their adsorption capacity.
3. Wide pore size distribution where there is not PAHs diffusional problems are the most suitable.
4. The hydrophobic nature of the carbonaceous material surface seems to favour the PAHs retention according to their chemical nature.
5. The adsorption of three-ring PAHs by adsorbents from waste hot gas emissions is inversely proportional to their volatility.

Key words*:* PAH, Adsorption, Carbon Materials, Hot Gas Cleaning, Energy Generation.