

Characteristics of Fly Ashes and Processing Conditions Affecting Carbon-Ash Separation under Pneumatic Transport, Triboelectric Processing

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ABSTRACT

In the EU and US there is tremendous potential for increasing the use of coal combustion fly ashes (CCA) as mineral admixtures in concrete and for decreasing concomitant construction costs. To achieve this potential, the ash industry requires flexibility in technological approaches because ashes from different sources have highly-variable characteristics. One approach is triboelectric separation. It relies on charging ash and carbon particles in a bipolar manner and then their separation under the action of an electric field. Charge magnitude and polarity are affected by moisture, both within the atmosphere and adsorbed on the particles. Studied experimentally, it has been found that the deleterious effect of moisture becomes more severe as particle size decreases; particles greater than 75 micrometers in diameter are nearly unaffected whereas particles smaller than 45 micrometers show up to a 400% decrease in their separability at low exposure levels. Slow and fast adsorption mechanisms are also evident. These results are discussed relative to efficient processing options and to theoretical calculations in which turbulent flow with particle-particle and particle-wall interactions are modeled.

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