Correlation of Fly Ash Carbon Properties and Mercury Uptake Capacities

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ABSTRACT

The annual cost of mercury control at 90% level using technologies based on injection of commercial activated carbons is estimated to be in the range $1–$15 billions and large excess of carbon sorbent is needed to be injected to ensure mercury removal. Moreover, there is a lack of understanding of the interaction between mercury and the carbon sorbent, and therefore, it is very difficult to predict the amount of carbon sorbent needed for a specific plant configuration. Accordingly, there is a clear need to find novel sorbents that can compete with expensive commercial sorbents and optimize their current performance. Due to its inherent porosity and adsorption properties as well as on-site availability, the authors have shown that fly ash carbons from coal-fired combustors or gasifiers are potential mercury sorbent candidates. Furthermore, due to the increasing restricted use of landfill, the coal industry is very interested in finding uses for these high carbon fly ashes, instead of their current disposal practice. The authors' previous work has shown that the mercury capacity changed significantly across the different fly ash samples collected. This work focuses on understanding the properties (particle size, porous texture, generation conditions, surface properties, etc) of fly ash carbons that affect their mercury sorption capacities in order to enhance their mercury capture performance. Oxygen functionality and the presence of halogen species on the surface of fly ash carbons have been found to promote mercury capture.

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