Mercury Emissions from Curing Concretes that Contain Fly Ashes and Activated Carbon Sorbents from Three Coal-Fired Power Plants

Linda K. Weavers[1], Chin-Min Cheng[2], Danold Golightly[1], Harold W. Walker[1], William Wolfe[1], and Ken Ladwig[3]

[1]The Ohio State University, Civil and Environmental Engineering and Geodetic Science, 470 Hitchcock Hall, 2070 Neil Ave, Columbus, OH 43210; [2]Institute for Combustion Science and Environmental Technology, Western Kentucky University, 2413 Nashville Road, Bowling Green, KY 42103; [3]EPRI, PO Box 10412, Palo Alto, CA 94303

KEYWORDS: mercury, fly ash, PAC, concrete

ABSTRACT

One method for reduction of mercury emissions from coal-fired utility boilers is injection of chemically modified powdered activated carbon sorbents into hot flue gas streams and subsequent capture of the mercury-containing sorbent along with fly ash. Upon re-use, this fly ash-sorbent may be incorporated into concrete. Possible differences in gaseous mercury releases from curing fly-ash concretes were investigated by collection and measurement of mercury from concretes that contained different fly ashes and carbon-based sorbents.

The observed emissions of mercury for the complete curing process demonstrated a dependency on mercury concentrations in the concrete, the type of coal burned, and the presence of sorbent. Release of mercury from these concretes was less than 0.31% of the total quantity of mercury present from all sources. The dependence of mercury release on the organic carbon content of the fly ash was particularly notable. Lower emissions of mercury were observed for the ash containing activated carbon sorbent than would be expected based on the correlation with organic carbon, suggesting that powdered activated carbon more tightly binds the mercury as compared to unburned carbon in the ash. During the extended curing tests, mercury release slowly diminished with time. The decrease in mercury emission corresponds to an expected loss of porosity for the concrete and loss of water to hydration reactions by the components of cement.

Submitted for consideration in the 2007 World of Coal Ash Conference, May 7-10, 2007.