Oxidation of Mercury via Catalytic Barrier Filters – Phase II
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The feasibility of oxidizing elemental mercury in coal combustion flue gas, using catalytic material impregnated onto fabric barrier filters was explored. Preliminary tests were performed in order to screen potential catalysts which suggested that palladium and titanium dioxide were attractive candidate catalysts. Several fabric coating methods were investigated to determine the best way to load a filter. A bench-scale test apparatus was constructed to automatically simulate cleaning pulses of a pulse-jet baghouse to determine long term integrity of the loaded catalyst. Filter samples were back pulsed up to 3000 times to determine the long term integrity of the catalyst coating. Changes in pressure drop across a catalyst-coated filter versus a bare filter were also determined. It was found that spray coating was an effective and commercially feasible technique for catalyst application. The mercury oxidation performance of the catalyst-coated filters was tested using a simulated flue gas in a bench-scale reactor under conditions similar to those found in a baghouse. Three potential catalysts were examined using an on-line mercury analyzer. A matrix of experiments was performed using potential contaminants such as SO_2 and H_2O. Based on these results, the most attractive catalyst candidate was selected for small pilot-scale testing using two parallel single filter baghouses attached to a 19 kW research combustor. On-line and Ontario hydro measurements of oxidation performance were performed for three coals: Illinois #6 bituminous, Eagle Butte subbituminous, and North Dakota lignite.