SCR Impact on Mercury Speciation in Coal-fired Boilers

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Selective catalytic reduction (SCR) technology is being applied increasingly for controlling emissions of nitrogen oxides (NOx) from coal-fired boilers. Some recent field and pilot studies suggest that the operation of SCR could affect the chemical form of mercury species (speciation) in the coal combustion flue gases. The speciation of mercury is an important factor that influences the control and environmental fate of mercury emissions from coal combustion. The vanadium and titanium oxides (V_2O_5, TiO_2), used commonly in the SCR catalyst for catalytic NOx reduction, may also promote the formation of oxidized mercury (Hg^{2+}).

The work reported in this paper focuses on studying the impact of SCR on Hg^0 oxidation. Bench-scale experiments were conducted to investigate Hg^0 oxidation in the presence of simulated coal combustion flue gases and under SCR reaction conditions. Flue gas mixtures with different concentrations of hydrogen chloride (HCl) and sulfur dioxide (SO_2) for simulating the combustion of bituminous coals and sub-bituminous coals were tested in these experiments. The effects of hydrogen chloride (HCl) and sulfur dioxide (SO_2) in the flue gases on Hg^0 oxidation under SCR reaction conditions were studied. It was observed that HCl is the most critical flue gas component that causing conversion of Hg^0 to Hg^{2+} under SCR reaction conditions. The importance of HCl for Hg^0 oxidation found in the present study provides a strong scientific base for the apparent coal-type dependence observed for Hg^0 oxidation occurring across the SCR reactors in the field.