Method for Removal of Mercury from Various Gas Streams

Opportunity

The Department of Energy's National Energy Technology Laboratory (NETL) is seeking licensing partners interested in implementing United States Patent Number 6,576,092 entitled "Method for Removal of Mercury from Various Gas Streams."

Disclosed in this patent is a novel, optical process for removing elemental mercury, in which a gas stream containing mercury is irradiated with 254-nm wavelength ultraviolet light. The irradiated elemental mercury is oxidized over a wide range of temperatures (0 °F to 350 °F) to form mercuric oxide or mercurous sulfate, which precipitate out of the gas stream. The precipitates can be filtered out or, because they are water soluble, dissolved in the wet scrubber solution. The difficult task of capturing mercury in a flue stream is thus made easier by photochemically oxidizing elemental mercury to form compounds that are more readily removed from the system.

Overview

Mercury is an environmental pollutant that is toxic to humans, known to cause neurological and kidney disorders, among others. More than 32 percent of the mercury emitted to the atmosphere in the United States is from coal-burning utilities. Existing control technologies for the removal of mercury from flue gas include scrubbing solutions and activated carbon sorbents. This invention removes elemental mercury from various gas streams with no solid or liquid additives and no moving parts; only 254-nm wavelength UV light is needed.

Laboratory bench-scale tests involving the flow of simulated flue gases through a quartz tube irradiated with low power UV lamps have demonstrated removal of mercury as high as 91% with less than 0.35% parasitic power losses. Concentrations of mercury as high as 1 ppm can be treated using this method, with no restrictive range of operating pressures. Applications include the treatment of gases arising from burning coal, oil, natural gas, and biomass. Incinerator flue gases and municipal solid waste effluents can also be treated. Because of the wide operating temperature range, this method could also be used to treat polluted indoor air, water vapor-containing fluids, engine exhaust, and refinery effluent.

Significance

This ultraviolet method of removing mercury from flue gas streams is

- inexpensive, involving low-power UV lamps and low parasitic power losses
- flexible, being capable of working over a wide range of temperatures, pressures, and flow rates
- robust, having no moving parts
- additive-free, requiring only UV light
- robust, being capable of working in the presence of SO_3, which poisons activated carbons
- versatile, being applicable to many industrial and consumer processes

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