



Regenerable Hydrogen Chloride and Hydrogen Sulfide Removal Sorbents for High Temperature Gas Streams

Opportunity

The Department of Energy's National Energy Technology Laboratory (NETL) is seeking licensing partners interested in implementing United States Patent Number 7,767,000 entitled "Regenerable Hydrogen Chloride Removal Sorbent and Regenerable Multifunctional Hydrogen Sulfide and Hydrogen Chloride Removal Sorbent for High Temperature Gas Streams."

Disclosed in this patent is the invention of a unique regenerable sorbent process that can remove contaminants from gas produced by the gasification of fossil fuels. Specifically, the process removes hydrogen chloride by using the regenerable sorbent and simultaneously extracts hydrogen chloride compounds and hydrogen sulfide from fuel gas. If gasification processes are to be successful, all contaminants in gas streams must be removed. This invention has accomplished that goal during tests by using a unique sorbent mixture composed of manganese oxides and inert binders.

Overview

During the gasification process, a number of components in coal and other carbon-based fuels form corrosive and toxic compounds. Current treatment systems use wet or dry scrubbing systems, which include added chemical compounds, to remove these contaminants. Two of the most significant corrosive compounds that must be removed from the coal gas stream are hydrogen chloride and hydrogen sulfide. To optimize costs and environmental effects of any process, researchers would prefer to use a regenerable sorbent. However, literature searches indicate that no regenerable sorbents exist that can remove hydrogen chloride levels at warm gas temperatures. Currently, hydrogen chloride can be removed by disposable sorbents but those sorbents create disposal problems.

The invention described here provides a method to remove hydrogen chloride from a gas stream that contains more than 5 parts per million of hydrogen chloride. The hydrogen chloride removal process takes place by exposing the hydrogen chloride-containing gas stream to a sorbent containing from about 5 weight percent to about 99.5 weight percent of manganese oxide. As part of the process, the temperature of the inlet gas stream typically ranges between 300 to 500 degrees centigrade. During the process, the sorbent is regenerated by increasing the temperature of the sorbent to greater than 500 degrees and exposing the sorbent to a gas containing at least 2 weight percent of oxygen. This material can also remove hydrogen sulfide and be regenerated at similar temperatures. Therefore, the sorbent can be used as multifunctional sorbent to remove both hydrogen chloride and hydrogen sulfide.

Significance

This regenerable sorbent invention has the following advantages:

- No previous literature citations exist for regenerable sorbents at higher temperatures
- It is regenerable and therefore can reduce or eliminate disposal costs
- Compared to nonregenerable sorbents, it effectively operates with high-temperature gas streams
- No additional costs are involved in the regeneration process
- It lends itself to being a multifunctional sorbent, a future goal of coal gasification systems

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