Scrubbing sulfur: New process removes sulfur components, CO2 from power plant emissions (w/ Video)

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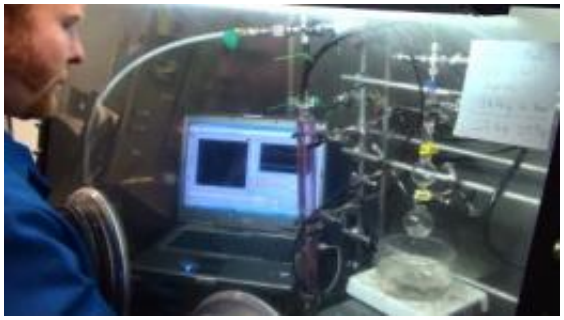

Pacific Northwest National Laboratory scientist David Heldebrant demonstrates how a new process called reversible acid gas capture works to pull more than just carbon dioxide out of power plant emissions. Credit: DOE/Pacific Northwest National Laboratory

The Department of Energy's Pacific Northwest National Laboratory has developed a reusable organic liquid that can pull harmful gases such as carbon dioxide or sulfur dioxide out of industrial emissions from power plants. The process could directly replace current methods and allow power plants to capture double the amount of harmful gases in a way that uses no water, less energy and saves money.

"Power plants could easily retrofit to use our process as a direct replacement for existing technology," said David Heldebrant, PNNL's lead research scientist for the project.

Harmful gases such as carbon dioxide or sulfur dioxide are called "acid gases". The new scrubbing process uses acid gas-binding organic liquids that contain no water and appear similar to oily compounds. These liquids capture the acid gases near room temperature. Scientists then heat the liquid to recover and dispose of the acid gases properly.

These recyclable liquids require much less energy to heat but can hold two times more harmful gases by weight than the current leading liquid absorbent used in power plants. It is a combination of water and monoethanolamine, a basic organic molecule that grabs the carbon dioxide.

PNNL's previous work with the all-organic liquids focused on pulling only carbon dioxide out of emissions from power plants. New work will show how the process can be applied to other acid gases such as sulfur dioxide.

"Current methods used to capture and release carbon dioxide emissions from power plants use a lot of energy because they pump and heat an excess of water during the process," said Heldebrant. He notes the monoethanolamine component is too corrosive to be used without the excess water.

In PNNL's process called "Reversible Acid Gas Capture," the molecules that grab onto the acid gases are already in liquid form, and don't contain water. The acid gas-binding organic liquids require less heat than water does to release the captured gases.

Heldebrant and colleagues demonstrated the process in previous work with a carbon dioxide-binding organic liquid, called CO2BOL. In this process, scientists mix the CO2BOL solution into a holding tank with emissions that contain carbon dioxide. The CO2BOL chemically binds with the carbon dioxide to form a liquid salt solution.

In another tank, scientists reheat the salt solution to strip out the carbon dioxide. Non-hazardous gases such as nitrogen would not be captured and are released back into the atmosphere. The toxic compounds are captured separately for storage. At

that point, the CO2BOL solution is back in its original state and ready for reuse.

Heldebrant and colleagues have developed organic liquid systems that bind three additional acid gases found in emissions. He will talk about new work with sulfur dioxide, carbonyl sulfide, and carbon disulfide -- all acid gases that are environmentally harmful -- at the American Chemical Society Fall 2009 Meeting and Exposition, Tuesday, August 18.

Source: Pacific Northwest National Laboratory (news : web)