PHYS.ORG

SequesTech: A novel process to capture and mineralize flue gas carbon dioxide

May 5 2011

(PhysOrg.com) -- A process that directly captures flue gas carbon dioxide from the combustion process and holds it has earned a patent for the University of Wyoming.

Professor KJ Reddy, whose career in research has spanned decades, began testing a mineral carbonation process three decades ago. Through his work, he proposed a technique that uses carbon dioxide to speed up the carbon mineralization process of industrial residues.

Now, Reddy's SequesTech process has shown that elements of flue gas, which include carbon dioxide, sulfur dioxide and mercury, can be simultaneously captured and turned into solid minerals without having to separate them from the flue gas. The process captures and holds carbon dioxide and other components of flue gas as an alternative to geologic storage, in which carbon dioxide is injected into pore spaces in underground geologic formations.

Many industrial processes produce flue gas, including those for cement plants, paper mills, steel plants and oil shale incinerators as well as municipal and medical solid waste incinerators. All release anthropogenic carbon dioxide into the atmosphere. These processes also create ash as a byproduct, Reddy says.

When Reddy's early work was published in both the Journal of Environmental Quality and the Environmental Science and Technology *Journal*, it laid the groundwork for mineral carbonation studies by other scientists, engineers and researchers. Mineral carbonation has been tested in the lab, but Reddy has now tested his technology in the field at the Jim Bridger Power Station at Point of Rocks, Wyo., owned by PacifiCorp.

"Because this process has a fast reaction time, we think it will have wide industrial applications," Reddy says. "All the inputs for this process are at the plant, so the process can be completed on-site."

Prior research by Reddy and others showed that separating the carbon dioxide from flue gas for mineralization has limitations because of the work involved in separation, transport and preparation for mineralization. Reddy and his team pioneered the process of capturing carbon dioxide directly from flue gas. This specific project shows that significant amounts of flue gas carbon dioxide, sulfur dioxide and mercury can be directly captured and mineralized by the fly ash particles under field conditions. The pilot-scale study shows this process to be cost effective with a minimum carbon footprint and can be retrofitted to existing coal-fired power plants or installed in new power plants as a post-combustion unit requiring very little of the plants generated electricity to run the process.

"It has been a pleasure working with the University of Wyoming on this project," said Bob Arambel, managing director, Bridger Plant. "We have been supportive of the project and are pleased that the initial results have been positive."

The project required the cooperation and collaboration of a wide range of team members. The team at the Bridger power plant consists of Arambel; Paul Fahlsing, director, plant operations; Jim Sedey, engineering manager; Roger Warner, maintenance planner; and Ryan Taucher, environmental analyst.

Reddy leads the UW team. The other members are Morris Argyle, adjunct chemical engineering professor; Michael Urynowicz and Jennifer Tanner, civil engineering professors; and Brandon Reynolds, research scientist from the UW Department of Renewable Resources. David Taylor, professor of agricultural economics and research scientist Thomas Foulke conducted the economic analysis of the process. The team has also included former graduate students Viswatej Attili, Hollis Weber and Mikol Christensen.

"This process has great advantages and complements conventional carbon capture and sequestration technologies by minimizing the cost," Bill Gern, UW vice president for research and economic development, says. "SequesTech holds immense promise in capturing and mineralizing flue gas carbon dioxide, sulfur dioxide and mercury. It is the most inexpensive technology we know of to capture flue gas carbon dioxide."

Provided by University of Wyoming

Citation: SequesTech: A novel process to capture and mineralize flue gas carbon dioxide (2011, May 5) retrieved 25 April 2024 from https://phys.org/news/2011-05-sequestech-capture-mineralize-flue-gas.html