A researcher is about to test a technology that he says could be a breakthrough for curbing greenhouse gas emissions from coal plants, natural gas generators and other industrial facilities.

EMISSIONS CAPTURE: A Canadian researcher hopes to prove that by running the emissions from an industrial plant through pulverized rock he can both capture carbon dioxide and turn it into a salable product.
Image: flickr/KaCey97007

Canadian professor Guy Mercier's answer to curbing fossil fuel emissions is literally set in stone. With $300,000 in new grant money from Carbon Management Canada, a network of academic centers, he plans to run gas emitted from a Holcim cement plant through pulverized concrete and rock.

If everything goes to plan, the resulting chemical reaction will capture 80 percent of the carbon dioxide from the tested gas stream at a lower cost than other capture methods.

In theory, the cost of capturing CO2 could head to zero, since the resulting magnesium carbonate formed from chemical reactions between cement plant emissions and rock can be sold at a profit to the wastewater and steel-making industries, Mercier said.

"This can be applied anywhere there's a huge amount of CO2 emitted from smokestacks," said Mercier, an environmental technology professor at the Institut National de la Recherche Scientifique, part of the University of Quebec. He is working with researchers from the University of Calgary and the University of Melbourne on the project.

Tweaking the rock mixture would allow the work to be applied to coal, he said.

Mercier's work fits into a growing industry focus on carbon capture and utilization, or using captured CO2 for commercial products, rather than storing it underground, where the gas holds no economic value. Earlier this year, the carbon capture industry added a "U" to the title of an annual CCS conference in Pittsburgh, making it the carbon capture, utilization and sequestration conference.

Use it; don't lose it

That "U" typically means enhanced oil recovery, but there is a growing interest in alternative funding options, such as using captured CO2 for algae production or pulp and paper processing. The firm Skyonic, for example, announced a deal earlier this year to capture carbon dioxide from a cement plant and turn the gas into baking soda, hydrocholoric acid and other products.

While some experts think these solutions are impractical for wide-scale use, others say there is a need for additional tests capturing carbon dioxide from cement, one of the highest-emitting industries.

Mercier's work comes as *Nature Climate Change* published a perspective piece Sunday, "Last Chance for Carbon Capture Storage," saying governments need to either increase their commitment to carbon capture technology or "accept its failure

and recognize that continued expansion of power generation from burning fossil fuels is a severe threat." Carbon capture has never been proved at scale in the power sector but is considered the chief way to control heat-trapping emissions from coal, gas and other fossil fuels.

Mercier said he chose a cement plant to test his patented technology for the simple reason that Quebec does not have coal-fired power plants. It also holds a large number of abandoned mines with adequate rock supplies, he said.

He will blend magnesium and calcium-rich rocks with concrete, turn them into a powder, and place the pulverized mix into a reaction chamber attached to the emission stream from the Holcim plant, about an hour from Montreal.

Trapping the carbon in rock

Once the CO2-rich flue gas hits the pulverized rocks, the resulting chemical reaction produces a solid of magnesium carbonate. That solid then can be sold to wastewater operators for water treatment, and to the steel industry, which can use it during the manufacturing process, said Mercier.

The chemical reactor "is like a small plant within the big plant," he said.

The initial field test at the cement plant -- which will begin in late 2013 and run for a year -- will be small, on less than 1 percent of the plant's emissions. That will require about 1.5 tons of rock, Mercier said.

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