Mineral Carbonation International

Mineral Carbonation – FAQs For Media

1. What is mineral carbonation?

Mineral carbonation is the reaction of carbon dioxide (CO_2) with basic minerals to form harmless solid carbonates, similar to antacids or baking soda. Mineral carbonation occurs in nature as the process of rock weathering by rainwater. Geologists believe that over millions of years this process reduced the excessive CO_2 in the prehistoric atmosphere to levels that enable life to survive today. Our aim is simply to mimic and accelerate this natural process to reduce harmful industrial emissions of CO_2.

2. How can mineral carbonation reduce greenhouse gas emissions and mitigate climate change?

By binding CO_2 up in a solid form, mineral carbonation can prevent it from accumulating in the atmosphere. CO_2 is the major greenhouse gas believed by most scientists to be causing recent climate change. CO_2 has rapidly built up in the atmosphere over the last hundred years due to the burning of fossil fuels.

3. Who or what is Mineral Carbonation International (MCi) and what do they do?

MCi is a joint venture between Newcastle Innovation (the University of Newcastle's technology transfer company), Orica and GreenMag Group. It is funded jointly by Orica and the NSW and Australian Governments. MCi is conducting mineral carbonation research and building a pilot plant at the University's Newcastle Institute for Energy & Resources (NIER) site which will produce carbonates for industry to test in new building products.

4. How does the process work?

Basic rock such as serpentinite is mined, crushed, heated and then mixed with water and pressurised with CO_2 to speed up the natural carbonation reaction which in turn forms stable magnesium carbonate powder and sand.

5. Will mineral carbonation support the coal or fossil fuel industries at the expense of renewables?

The world's energy needs will continue to be met largely by fossil fuels until alternatives like renewable energy sources are more developed. Many other industries also emit CO_2, including cement, metals manufacture and transport. There is already an excess of CO_2 in the atmosphere, so CO_2 mitigation solutions like mineral carbonation are required now and in the future, even as the world moves to more sustainable alternatives.

6. Will mineral carbonation mean more mining?

In general, yes, more mining will be required to supply the minerals for carbonation. By doing this, the mining industry could in fact become a large part of the solution to our most pressing global environmental problem. In this case no old mines will be left behind in the landscape since most of the product material will be replaced in the original mine, while by-products of the process can reduce the need for primary mining of other materials.

7. How much mining is required for mineral carbonation?

The mining scale will be smaller than the scale of mining for coal. In fact, to secure all the CO_2 produced from coal, only half as much mineral silicate rock will be needed as the original amount of rock mined to extract the coal that produced the CO_2.

8. Will mineral carbonation introduce new environmental or safety concerns?

A new mineral carbonation industry will require land, water and infrastructure. Environmental and safety management is expected to be at industry best practice. The overall impacts will be localised and will stimulate local economies. The overall aim of mineral carbonation is to produce a large net environmental benefit by reducing CO_2 in the atmosphere to assist in avoiding the worst of the predicted dire impacts of climate change globally.

9. Is mineral carbonation cost-effective?

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We believe it will be. One of the aims of this four-year project is to improve its cost-effectiveness to make it an economically viable process under future carbon pricing schemes.

10. Is there sufficient mineral to store significant quantities of CO_2? Will we run out of mineral and what else could it be used for?

There is more than enough mineral to store all the CO_2 emissions from available fossil fuels for centuries to come. There is no other known economic use for the serpentinite, and it occurs in land of low agricultural value.

11. Are there any valuable by-products of the process?

Potentially, yes. Metals such as iron, nickel and chrome can be extracted in this process, while the carbonate and silica produced could be used in construction materials.

12. The IPCC study into the potential for mineral carbonation found: that a power plant with a full CCS system using mineral carbonation would require from 60-180% more energy than the power plant alone, surely, this is not feasible as a method of CO_2 abatement? Is that true?

The IPPC report in 2005 summarised earlier work by various researchers. It did not consider the MCi approach of direct thermal activation of serpentine which is much more energy efficient than the cases considered in 2005.

While there will always be a penalty in capturing and securing CO_2 as opposed to simply venting it to the atmosphere, our research is aimed at reducing this penalty as much as possible.

Media Contact: Marcus St. John Dawe, CEO MCi, on +61 (0) 419 722 386