



CO₂ Energy Reactor[®]

CO₂ as a feedstock

CO₂ sequestration and the production of valuable materials like Silica, Mg-, Ni and Cr-Carbonates in one process!

Nature's way of geological storing CO₂, in a human time scale

Innovation Concepts BV has realised a process to speed up the mineral CO₂ sequestration and to recover the exothermic energy.

A patent is granted for this brand new idea.

Together with a number of internationally renowned scientists, a reactor is designed in which CO₂, water and silicate minerals are reacting in a fast way.

This reaction produces so much energy, much more than the process itself needs. The remaining energy can be delivered to third parties or be used to generate electricity.

The CO₂ is permanently mineralized and will not be released into the atmosphere.

Based on proven technologies, this is a novel way to produce valuable materials on a sustainable and cheap way.

From waste to resource

For every ton of CO₂ fixed three tons of very useful resources are created. These are applicable in metal production like Mg, Nickel, Chromium.

The CO₂ emission of power plants and industrial processes can be used and the reaction heat can be exchanged.

CO₂ balance

The CO₂ balance is negative, which means that throughout the chain from mining, milling, transport and up to the production of Mg-Carbonate, much more CO₂ is bound than is released (>90% depending on location).

Capacity

The minimum capacity is app. 15.000 Tonnes CO₂ yearly.

But this can be expanded to huge amounts; even the capacity of a power plant can be achieved.

In this way useful products are manufactured and very large quantities of CO₂ are finally sequestered.

Costs

CO₂ is used as an acid for the reacting with alkaline minerals like Mg-silicates to produce valuable products. This is performed in the CO₂ Energy Reactor[®], which is much more effective than the common used techniques. The CO₂ price does not "pay the bill", the process runs on the benefits of the produced products.

Energy

The design of the CO₂ Energy Reactor[®] makes it possible to run the process autonomous and exchange app. 50 % of the reaction heat for other applications.

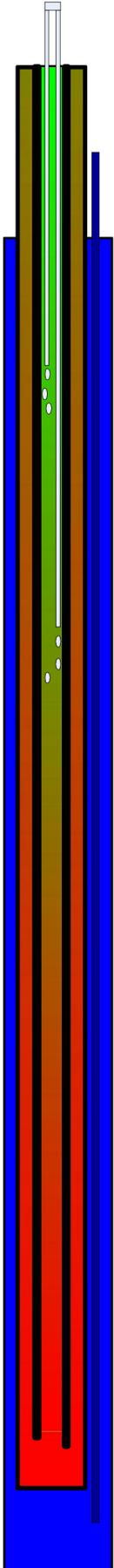
Technical details:

For further information see reverse side.

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CO₂ Energy Reactor[®] is a trademark of
Innovation Concepts BV
and is covered by patent NL 2004851



Technical explanation CO₂ Energy Reactor[®]

CO₂ as a feedstock

A groundbreaking and patented way to use CO₂ as a feedstock for producing silica and several Carbonates like Mg-, Ni- and Cr-Carbonates.

Reaction

The reaction parameters are depending on the used minerals.

In principle, many "silicates" are eligible, but the most obvious are Olivine and Serpentine.

For Olivine the reaction is:



The reaction speed is further enhanced by attrition, which is caused through the interaction between the particles.

Technology

We use two kind of proven technologies:

- The first part of the process, CO₂ is used as a reactant for breaking the mineral structure and dissolves this into bi-carbonates. This is performed in a CO₂ Energy Reactor[®]. This special continue autoclave system is significant more efficient then the common reactors.
- During the second part of the process, the bi-carbonates will be crystallized in a special separation process.

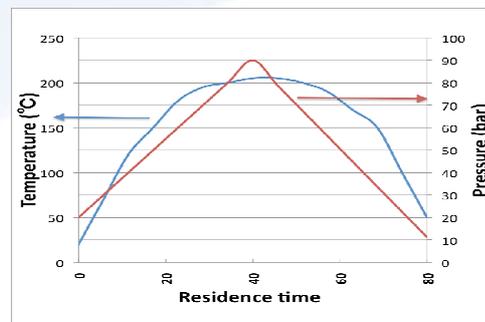
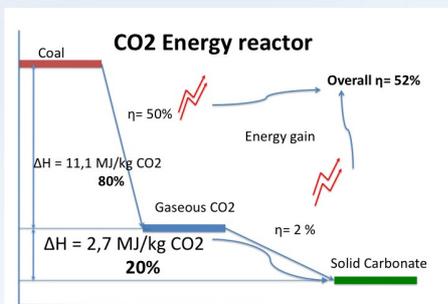
This makes it possible to produce almost pure silica and carbonates.

CO₂

The CO₂ doesn't have to be 100 % concentrated. A concentration of 70% can be used.

Energy production

The reaction is exothermic. The heat released is so much that this process can maintain its own energy and the remaining energy can be recovered for other purpose.



Process

The Silicates, water and CO₂ are fed into a special continuous pipe shaped autoclave. Under optimal conditions (≈180 °C and 100 bar) these materials are reacting. At this reaction, heat is produced (this keeps the process running without any additional energy inputs). As a matter of fact even energy can be recovered.

Technical breakthrough

The design is very innovative. There is an energy neutral pressure built up to 100 bar, a highly efficient heat exchanger (> 80%) and a continuously moving three-phase mixture. This causes extra attrition (to remove the passivating layers) and consequently is the reaction much faster.

Patent

Innovation Concepts B.V. has a patent NL2004851, international patent is pending