**Capture and mineralization of CO2 to yield metal carbonates**

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**Highlights**

* Capture and sequestration of CO2 is priority for the coming years.
* Capture of CO2 to form metal carbonates is an interesting mitigation of Climate Change.
* Perfect mixing semibatch reactor is a simple device for capturing CO2.
* Metal carbonates are interesting in various industrial sectors.

**1. Introduction**

Climate change due to global warming is one of the most important problems that humanity currently faces, regionally and globally. The physico-chemical consequences associated with the absorption of infrared radiation and the amounts emitted by different sources are the main cause of global warming, as reported by the Intergovernmental Panel on Climate Change in recent years (1). There are several processes for the capture and sequestration of CO2, (2) one of the simplest processes for the latter comprises its adsorption and chemical reaction. In this work, we present results of the capture and sequestration of CO2 through metal hydroxides aqueous solutions to obtain metal carbonates.

**2. Methods**

The capture and sequestration tests via reaction between metals hydroxide solutions with gaseous CO2, were performed in a perfectly mixed semibatch reactor, with 15.17 ml min-1 CO2 continuous flow at atmospheric pressure and two reaction temperatures: 25 and 30 °C. In all the tests 250 ml of 0.06 and 0.07 M Sr, Ba, Mg hydroxide aqueous solution were used, which corresponds to the saturated solutions, the variation of pH, temperature and the mass of dry metal carbonate formed according to the reaction time. All the solids were characterized by X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), elemental analysis by means of Energy Dispersive Spectroscopy (EDS) and Fourier Transform Infrared Spectroscopy (FTIR).

**3. Results and discussion**

In each capture and sequestration test, the reaction between the gaseous CO2 and the alkaline metal solutions formed solid precipitates, which after filtering, washing and drying were weighed to calculate the reaction yield; during the reaction, a decrease in the pH of the solution was observed, as well as an increase in temperature as a function of reaction time. The analysis of the solids by XRD shows that the corresponding metal carbonate was formed, as shown in figure 1a, where the characteristic peaks of the metal carbonates can be identified, the analysis of the samples by SEM / EDS, shows that the solid formed presents different morphologies, such as that shown in figure 1b, where the solid appears as acicular crystals with longitudinal dimensions of 3 µm by 0.15 µm; the elemental analysis shows the presence of C, O and metal, which can be attributed to the carbonate formed, while the FTIR results shows the characteristic bands of the carbonates at the most intense wavelengths at 1442 cm-1 to 20 min, at 1440 cm-1 to 30 min and at 1452 cm-1 to 40 minutes of reaction and at 854 and 705 cm-1, for all reaction times.



1. (b)

**Figure 1.** a) XRD diffraction pattern, b) SEM microscopy of strontium carbonate

The capture of CO2, to form strontium carbonate (SrCO3) is of interest in various industrial sectors such as: in the refining of sugar and the manufacture of military rockets. Magnesium carbonate (MgCO3) is used as a reinforcing agent in neoprene rubber, as a drying agent and for color retention in food and cosmetics, it is also used as an antiacid in medicine, these capture alternatives give value added to CO2 sequestration products via carbonate formation

**4. Conclusions**

Through a simple system of perfectly mixed semibatch reactor, it is possible to capture CO2 to form metal carbonates under simple conditions at atmospheric pressure and temperature, which represents a sustainable process due to its low energy consumption. According to the results of X-ray diffraction, the solids formed are the metal carbonates of the metal hydroxide solutions. The formed solids present different morphologies according to the results of scanning electron microscopy.

**References**

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