# $CO_2$ HYDRATION USING CARBONIC ION SOLUTION

**MUHAMMAD FARIS BIN RAZALI**

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**FACULTY OF CHEMICAL ENGINEERING**
**UNIVERSITI TEKNOLOGI MARA**
**SHAH ALAM.**

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# ABSTRACT

The carbon dioxide emission has been increased which can cause the global warming and other environmental impacts. The carbon sequestration process has been introduced as one of the method to reduce the amount of carbon dioxide in the atmosphere. Through mineral carbonation, carbon dioxide is stored in form of stable mineral carbonate such as calcium or magnesium. In this research, the mineral carbonation was performed by using carbonic ion solution which accelerated by carbonic anhydrase enzyme. Two parameters were being studied which are the effect of the $CO_2$ flowrate and $CaCI_2$ concentration towards hydration process of $CO_2$. These two parameters were been varies to study the effect towards hydration of $CO_2$. In this study, the CO2 flowrates were adjusted to 200, 500 and 800 L/min. While, the $CaCI_2$ concentration were set up to 12.15,36 and 48 g/L. Then, the analysis of $CaCO_3$ powder were proceed using three type analyses which were Fourier Transform Infrared (FTIR), X-Ray Diffraction (XRD) and also Scanning Electron Microscope (SEM). From the results obtained, the higher CO2 flowrates produced high amount of precipitated. Based on the plot, the highest amount of $CaCO_3$ powder was obtained at 800 L/min. Meanwhile, for the effect of $CaCI_2$ concentration, the amount of $CaCO_3$ obtained was increase when the $CaCI_2$ concentration was increased. According to the analyses performed, it showed that, the $CaCO_3$ powder produce the calcite phase of the $CaCO_3$.

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# INTRODUCTION

## 1.1 Overview

The carbon dioxide ($CO_2$) emission had been increased to the environment due to the industrial growth that contributed to the carbon dioxide release. The $CO_2$ release had contributed to greenhouse effect and other climate changes around the world. The carbon capture and storage technologies where been introduced which can reduce the greenhouse gas including carbon dioxide. The carbon sequestration is the process in the carbon capture and storage method which involve long term storage. The mineral sequestration is the carbon sequestration technologies also known as mineral carbonation which involve carbon dioxide fixation into the stable carbonate mineral such as calcite as $CaCO_3$, dolomite as $CaO.5MgO{\cdot}5CO_3$, magnesite as $MgCO_3$ and siderite as $FeCO_3$. The mineral carbonation also known as mineralization of CO2 and it occurs by the direct contact of the CO2 with the mineral source like magnesium or calcium. Then the precipitate was formed as the end of the product. In this research, the $CO_2$ was converted to value added product like calcium carbonate which have many applications. The $CO_2$ hydration using the carbonic ion solution followed by the precipitation of calcium carbonate. Both of two processes accelerated by carbonic anhydrase enzyme.

## 1.2 Research Background

The $CO_2$ is known as greenhouse gases that contributed to greenhouse effect. $CO_2$ emission is mainly cause by the combustion of fossil fuels and the industrial growth. The carbon capture and storage techniques have been introduced to capture the $CO_2$ produced and prevent it from emitted to the atmosphere. This technologies chain, there are consist three part which are capturing the $CO_2$, transporting the $CO_2$ and storing the $CO_2$ in underground. For example, in the depleted oil and gas wells or in deep saline aquifer formation.