

**ANNUAL PROJECT REPORT  
AS OF DECEMBER 2000**

1. PROJECT SPONSOR:

Department of Chemical Engg.  
The Ohio State University  
140 W. 19<sup>th</sup> Ave.  
Columbus, OH 43210

2. PROJECT MANAGER:

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Telephone: (614) 688-5598

3. OCDO GRANT NO: OCRC/00-C1.12

4. PROJECT UPDATE ✓ OR  
FINAL REPORT

5. PROJECT TITLE: Carbonation of Mg and Ca-bearing Minerals: Kinetic and Mechanistic Studies

6. PROJECT TERM: FROM: September 1, 2000

TO: August 31, 2001

7. BUDGET:

<u>CO-SPONSORS NAME</u>	<u>COST SHARE</u>
OCDO	\$ 79,643
Ohio State University	\$ 36,916
Total Project Cost:	\$ 116,559

**I. ABSTRACT**

8. OBJECTIVES:

Carbon dioxide emissions from coal usage in the state of Ohio are nearly 0.1 gigatonnes per year. State of Ohio ranks second only to state of Texas in annual CO<sub>2</sub> emissions. The U.S. DOE has identified mineral sequestration as a potential CO<sub>2</sub> sequestration option. Mineral sequestration can convert separated and captured CO<sub>2</sub> to products appropriate for long-term, environmentally benign, and unmonitored storage. The primary focus of this work is to conduct systematic interaction kinetics and mechanism studies for carbonation of Mg and Ca-oxide-bearing mineral sorbents.

9. WORK DONE AND CONCLUSIONS:

Minerals with high levels of Mg oxide were procured and characterized. Exact chemical composition of procured minerals was determined a battery of analytical tools including ICP-MS and XRD. The average concentration of Mg in the minerals was found to be 22 wt %. Surface and pore properties and surface morphology of procured minerals were determined using a low temperature N<sub>2</sub> adsorption apparatus (NOVA 2200) and Scanning Electron Microscopy (SEM), respectively. *Olivine1* and *serpentine* showed twice-larger total pore volumes than that of *olivine2*, whereas *olivine1* resulted in the highest specific surface area. The ground minerals were found to have wide size distributions and rough irregular surfaces.

#### 10. PLANS FOR THE COMING YEAR:

In the coming year, preliminary carbonation reaction studies (both dry and slurry carbonation) will be carried out on the procured minerals. Dry mineral carbonation would involve direct carbonation experiments with procured mineral samples in a differential bed reactor. Mineral slurry carbonation would involve experiments under fixed conditions of slurry solids concentration, CO<sub>2</sub> partial pressure, temperature and pressures in a slurry-bubble column reactor to identify solids with the highest capacity and rate for carbonation in aqueous solutions.

### **II. HIGHLIGHTS/ACCOMPLISHMENTS**

None. The project has just started.

### **III. ARTICLES/PRESENTATIONS**