

# Synthesis and gas-solid carbonation of mesoporous magnesium oxide under wet CO<sub>2</sub>

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Greenhouse gas emissions, in particular carbon dioxide, are considered as the main causes of the global warming. So, capture and storage of CO<sub>2</sub> coming from industrial installation are major environmental objectives. One way of CO<sub>2</sub> separation and capture is to use carbonation/decarbonation cycles on various capture masses. Among numerous candidates, magnesium oxide presents the advantage to form a thermodynamically stable carbonate, to be regenerable by simple heating, and to be available in large quantities and at low-cost.

If magnesium oxide has been largely studied for applications in catalysis, its use as CO<sub>2</sub> capture mass remains misunderstood. Thus the reaction of MgO carbonation made the object of few studies, and the main ones [1-2] deal with utilization at high temperatures (300-350°C) and high CO<sub>2</sub> pressures (10-20 bar).

In this work, we are interested in both the synthesis of magnesium oxide with high specific surface area, and its carbonation properties at atmospheric pressure.

The way of synthesis of a mesoporous magnesium oxide is described, as well as the physico-chemical characterizations of such an oxide. The reaction of carbonation is followed by means of thermogravimetric experiments. The influences of temperature, CO<sub>2</sub> partial pressure and water vapor partial pressure are investigated. These results are completed by the characterizations of textural and morphological properties of the solid and their change during the reaction.

[1] J. Fagerlund, J. Highfield, and R. Zevenhoven, "Kinetics studies on wet and dry gas–solid carbonation of MgO and Mg(OH)<sub>2</sub> for CO<sub>2</sub> sequestration," RSC Adv., vol. 2, no. 27, p. 10380, 2012.

[2] S. Kumar, S. K. Saxena, V. Drozd, and A. Durygin, "An experimental investigation of mesoporous MgO as a potential pre-combustion CO<sub>2</sub> sorbent," Mater. Renew. Sustain. Energy, vol. 4, no. 2, Jun. 2015.