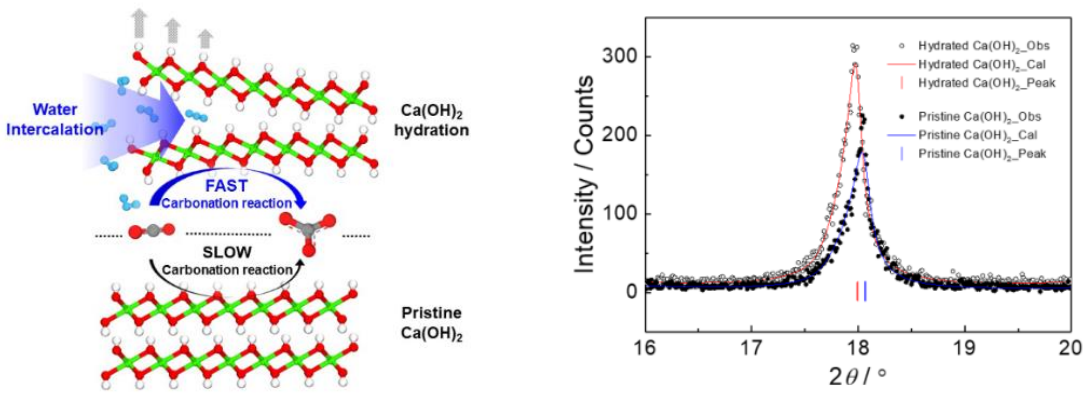
Title: Effects of the hydration process on kinetics of carbonation of lime*

Teodora Ilić, Carlos Rodriguez Navarro
University of Granada, Faculty of Science, Department of Mineralogy and petrology, Avenida de Fuente Nueva s/n, 18071, Granada, Spain, **teodora@go.ugr.es**

Research on the carbonation step in the cycle of Ca-rich lime is crucial to understand its applications in modern construction as well as in cultural heritage conservation. While studying this process, one can notice that the details of the hydration process of $Ca(OH)_2$ play an important role in the carbonation process that follows it. There is work on the process of crystallization of $Ca(OH)_2$ and its conversion to $Ca(CO)_3$, but not so many implications of how do the water molecules interact during the process of hydration.

Following the work of *J. Park et al*., we want to see how does the reaction between $Ca(OH)_2$ and water molecules later affects its carbonation, from a kinetic point of view and is there really the step of "water intercalation" between the layers of calcium hydroxide upon its hydration.

For this preliminary research, we have used hydrated lime which was fully dried, so we can avoid any former hydration. Later, the material was hydrated in two different ways, the first one being exposure of the material to water vapor (closed system with around 90% of relative humidity), in the absence of CO_2, for 7 days. The second method was immersing the sample directly into lime water (saturated solution of $Ca(OH)_2$), letting it to react for one hour. After hydration process, XRD analysis was done for both samples. Later on, carbonation process will be tested for both types of hydrated $Ca(OH)_2$, with the means of TGA and SEM analysis.



a) b)

Figure 1 [1]: a) water intercalation process; b) XRD analysis found in literature, showing the shift of $Ca(OH)_2$ peak, after the hydration process.

With this work, we want to test does water intercalation in the layers of $Ca(OH)_2$ really occurs, and can this mechanism of water absorption play a significant role in explaining certain types of kinetic model, that currently explain the evolution of carbonation of calcium hydroxide.

Reference

[1] Ju Hyun Park, Sun Ha Kim, Jin Chul Kim, Byoung-Young Choi, Sang Kyu Kwak, O.H. Han, Yong-Il Kim, Seung-Woo Lee, Role of intercalated water in calcium hydroxide interlayers for carbonation reaction, CEJ, Volume 420, Part 3, 2021.

****This project has received funding from the European Union's Horizon 2020 research and innovation programme under Marie Sklodowska-Curie project SUBLime [Grant Agreement n.º 955986.]***