# GROWTH OF BRUCITE ON PORTLANDITE CRYSTALS

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The present work is framed within the context of self-protective layer formation on concrete. In the course of exposure to the environment, various layers of different nature may form on the concrete surface. For example, concrete exposure to $CO_2$ is known to lead to calcite formation, which partially inhibits further chemical reactions (GALAN et al., 2015). The potential protective effect of brucite formation on concrete has been less explored (BUENFELD & NEWMAN, 1986). In the present study portlandite crystals, as a main mineral in common concrete, were synthesized (Fig.1a) and subsequently coated with nail polish, leaving only one of the hexagonal surfaces free. The partially coated crystals were immersed in magnesium containing solutions for the brucite layer to grow (Fig.1b). Three magnesium salt solutions were chosen: sulfate, nitrate and chloride. To identify and characterize the brucite grown on the surface of the crystals XRD, FTIR and optical microscopy were used. The concentration of $Ca^{2+}$ and $Mg^{2+}$ in the solution was followed with time by means of Ionic Chromatography. Thermodynamic calculations were performed with PHREEQC to analyze the effect of the variables on the precipitation of brucite in the presence of portlandite. The growth of brucite is affected by the nature of the anion accompanying magnesium: in the magnesium sulfate solution, additionally gypsum forms, whereas in the case of nitrate and chloride only brucite precipitates. The ratio of the exposed surface of the crystal to the volume of water and that of the exposed surface to the concentration of magnesium in the solution control the growth and the final quality of the surface layer. Preliminary results on the effect of various parameters on brucite layer formation on portlandite will be presented and discussed.

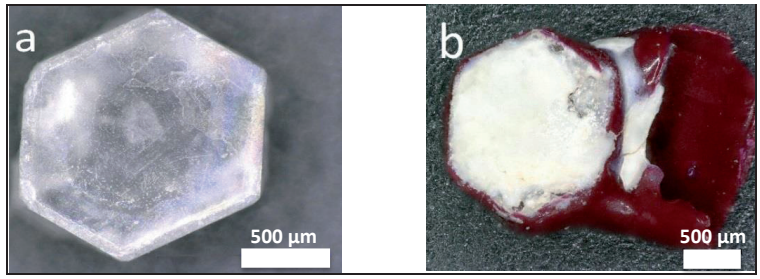


Figure 1. a) portlandite crystal. b) brucite coated crystal.

GALAN, I., GLASSER, F.P., BAZA, D., ANDRADE, C. (2015): Cem. Concr. Res. 74, 68–77.
BUENFELD, N.R., NEWMAN, J.B. (1986): Cem. Concr. Res. 16, 721-732.