The effect of Mg on the caracteristics of calcite crystal aggregates grown in biomimetic gelatin hydrogel systems

FITRIANA NINDIYASARI[1], ERIKA GRIESSHABER[1], LURDES FERNÁNDEZ-DÍAZ*[23], JOSÉ MANUEL ASTILLEROS[23], NURIA SÁNCHEZ-PASTOR[2], ANDREAS ZIEGLER[4] AND WOLFGANG W. SCHMAHL[1]

[1]Department für Geo- und Umweltwissenschaften, Ludwig-Maximilians-Universität München, München, Germany
[2]Department of Crystallography and Mineralogy, Complutense Univeristy of Madrid, Spain (correspondence: *lfdiaz@geo.ucm.es)
[3]Intitute of Geosciences (UCM,CSIC), Madrid, Spain
[4]Central Facility for Electron Microscopy, University of Ulm, Ulm, Germany

Biomineralization often occurs in gelatinous environments with characteristics similar to those of hydrogels [1]. We use gelatin hydrogels with two solid contents (2.5 and 10 wt %) and Mg in the aqueous solution filling their pores to study the crystallization of $CaCO_3$. Both parameters strongly influence the characteristics of the $CaCO_3$ precipitate, which in all experiments mainly consist of calcite aggregates with different Mg contents. Mg incorporation into calcite is promoted in heavier hydrogels where calcite aggregates can reach $MgCO_3$ contents up to 26 mol %. A positive correlation between Mg incorporation and the development of small boundary angles is observed. These small boundary angles most likely form to release Mg incorporation-related misfit strain. and explain the evolution from calcite aggregates consisting of subunits with the c-axes arranged in a fan-like orientational spread to spherulites as the amount of Mg incorporated increases [2].

Calcite aggregates incorporate the polymeric hydrogel network during growth. This network appears as both, thin fibrilar matrices ocluded within crystalline subunits and thick membranes separating subunits. The amount of incorporated polymeric network as well as the characteristics of the membranes depend on both, the density of the hydrogel and the presence/absence of Mg in the growth medium and reflect a complex balance between the mechanical properties of the hydrogel and crystal growth rates.

[1] Nindiyasari, Fernández-Díaz, Griesshaber, Astilleros, Sánchez-Pastor & Schmahl (2014) *Cryst. Growth Des.*, **14**, 1531-1542. [2] Nindiyasari, Griesshaber, Fernández-Díaz, Astilleros, Sánchez-Pastor, Ziegler & Schmahl (2014) *Cryst. Growth Des.*, **14**, 4790-4802.