# Influence of additives on phase behavior and crystallization of amorphous calcium carbonate

ZHAOYONG ZOU[1], LUCA BERTINETTI[1], YAEL POLITI[1], STEVE WEINER[2], LIA ADDADI[2], PETER FRATZL[1] AND WOUTER J. E. M. HABRAKEN[1*]

[1]Max Planck Institute of Colloids and Interfaces, Department of Biomaterials, Potsdam, Germany (* correspondence: wouter.habraken@mpikg.mpg.de)

[2]Weizmann Institute of Science, Department of Structural Biology, Rehovot, Israel

Amorphous phases like amorphous calcium carbonate (ACC) have attracted wide interest recently not only because they play critical and diverse roles in biomineralization, [1] but also because of the heavily discussed formation mechanisms. In literature the role of inorganic/organic additives in controlling the formation and crystallization of ACC has been studied in detail. However, so far, a satisfactory understanding of their influence is still not achieved. To retrieve mechanistic data, a systematic study on the effects of these additives is required. To this aim, in our previous studies, additive-free ACC with different particle sizes was obtained under precise control of the synthesis conditions. From this data we concluded that the formation of ACC fits a spinodal decomposition mechanism and we could describe the effect of ACC particle size on its stability and polymorph selection.

Building on the results of these studies, here we report the effects of additives like $Mg^{2+}$ ions, phosphate and (poly) aspartic acid on the phase behavior and chemical/structural properties of ACC as well as its subsequent crystallization in solution. Though all additives have proven to influence either the formation and/or stabilization of ACC we show that in each case there is a different mechanism behind this phenomenon.

[1] L. Addadi, S. Raz, S. Weiner, *Advanced Materials* 2003, **15**(**12**), 959.