

Influence of charged polypeptides on nucleation and growth of CaCO₃ evaluated by counterdiffusion experiments

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Abstract-

Many mineralization processes occur in convection-free conditions. Understanding these processes requires knowledge of crystal nucleation and growth processes in gels or high viscous sol systems. In this work, the crystallization parameters of calcium carbonate in an agarose viscous sol using counterdiffusion crystallization were monitored as a function of time. Additionally, by comparing the precipitation parameters in the high viscous sol entrapping charged polypeptides, namely, poly-l-lysine (pLys), poly-l-aspartate (pAsp), and poly-l-glutamate (pGlu), it was possible to establish the polypeptide capability to inhibit, or eventually promote, the calcium carbonate nucleation and/or crystal growth processes. The polymorphism and morphology of the precipitates indicate that pLys only influences the growth mechanism of calcium carbonate without affecting the nucleation process. On the contrary, pAsp and, to a minor extent, pGlu affect both nucleation and growth. The application of this analysis can be extended to other additives and macromolecules able to affect crystallization processes.

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