

Structural changes and thermodynamic pathways during the heat-, and moisture induced crystallization of biogenic and synthetic amorphous calcium carbonate: An *in situ* study

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We use time-resolved total x-ray scattering to monitor the heat-, and hydration-driven crystallization reaction of synthetic (prepared in the presence or absence of magnesium and/or phosphate ions) and biogenic amorphous calcium carbonate (ACC). PDF analysis was applied to follow the structural changes in the mineral during crystallization. We also relate the structural development of the different ACCs with information on the energy of the process derived from TGA and isothermal DSC measurements. Our results allow a mechanistic interpretation of the different crystallization pathways discussed in literature, solid-state transformation and dissolution-reprecipitation, in biogenic and synthetic systems, and of the role of additives in the stabilization and polymorph selection of ACC.