Transformation & crystallization energetics of synthetic & biogenic amorphous calcium carbonate (ACC)

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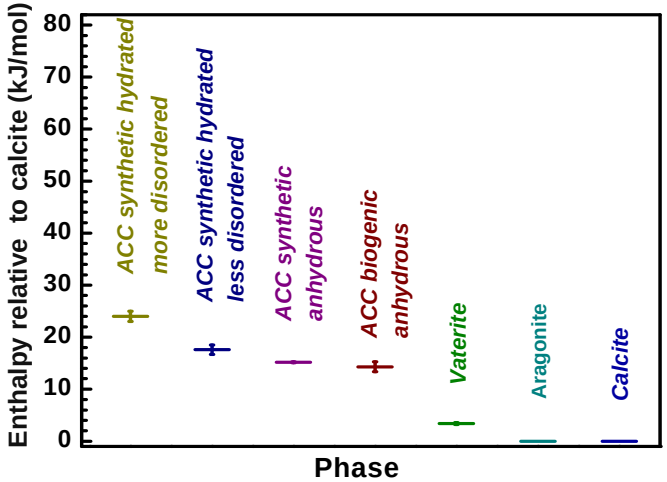
The transformation/crystallization enthalpies were measured using isothermal acid solution calorimetry and Differential scanning calorimetry (DSC). This study provides information on the metastability, dehydration, and crystallization energetics, and a possible crystallization pathway for ACC

Stability diagram with respect to calcite



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<u>The Major Findings</u>:

- ACC is a highly metastable phase compared to all crystalline $CaCO_3$ polymorphs
- Dehydrated synthetic ACC produced by heating is energetically similar to biogenic ACC
- The formation of anhydrous ACC from hydrated ACC is exothermic
- ACC crystallization is energetically downhill through stepwise evolution of series of phases
- These results shed some light on the possible initial stages of crystallizations of a calcium carbonate phase when CO_2 is injected underground and hence relevant to CO_2 sequestration.