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Amorphous magnesium carbonate precipitation under the influence of different additives

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Since global warming has been a key concern in the environmental field, the study of carbon capture and reuse has attracted great interest for researchers in the fields of science and engineering. The crystallization of magnesite (MgCO3) is a promising strategy for this purpose, though limited by the slow kinetics of MgCO3 precipitation. Additionally, formation of magnesite requires of moderate temperatures to avoid the formation of hydrated phases. Amorphous magnesium carbonate (AMC) is a transient phase in the formation of magnesium carbonate, which may play a key role in the final water content and structure of the crystalline MgCO3 polymorph precipitated. In this study, AMC precipitation experiments were conducted to clarify the role of different additives in the water content and kinetics of AMC formation. These additives included NaCl, Na2SO4, Na2O3Si, sodium acetate and sodium citrate.

The precipitation of amorphous magnesium carbonate -AMC- was investigated experimentally with 80 potentiometric magnesium titration experiments at room temperature pH 11.00 and room temperature, kept constant by continuous NaOH addition. Here we show, using XRD, FTIR, TG and TEM that the presence of organic additives such as acetate or citrate in the reaction media can reduce the amount of water present in the AMC precipitated. They also have an impact on the onset of AMC nucleation. On-going experiments are focussed on exploring whether these findings translate into an effect of such additives on the final crystalline MgCO3 polymorph precipitated.