

Growth inhibitors on calcite

Progress report

Precipitation experiments with the constant composition setup were performed with the amino acids Aspartic acid (Asp) and Glycine (Gly). Calcium concentration was measured by AAS and the values were constant $\pm 5-6\%$. Calcite used as seed material was treated before addition to the working solution and characterized by BET. It has a surface area of $0.5\text{ m}^2/\text{g}$. The concentration range of the amino acids investigated was from 0.02 to 0.4 mM. They were added approximately 30 minutes after precipitation started; growth rate was recorded for about 3 hours. Growth rate of the pure (inorganic) system was of the order of magnitude of $10^{-7}\text{ mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ and the change after the addition was calculated from the kinetic diagram. Aspartic acid shows a higher inhibitory effect than Glycine. The extra $-\text{COOH}$ group of Asp is the main responsible of this effect.

Polymers of the respective amino acids were tested using the same experimental setup. Poly-glycine with 5 units length showed no effect on the growth rate, while poly-Aspartic acid, as a long polymer of undefined length and as a 5 units polymer, did. When the concentration is increased, both of them inhibit completely calcite precipitation, but the 5 units polymer has a longer inhibiting effect due, probably, to his homogeneous conformation. These findings show the higher influence on precipitation rates exerted by the carboxylic group, rather than the amino group.