

Interaction between dissolved silica and calcite

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In this experimental study, we investigated the interaction between dissolved silica and calcite during adsorption and coprecipitation. Adsorption experiments were performed at 25°C and several partial pressures of CO₂. We could not measure any change of silica concentration in solution, even when the amount of calcite was high (600 g/L). However, analysis of the solid phase showed that calcite uptake of silica increases with increasing SiO_{2(aq)} concentration. At 0.5 mmolar SiO_{2(aq)}, the fraction associated with the solid phase was approximately 1 μmole/m² and it increased by a factor of 2 when dissolved silica concentration increased to 2 mmolar. The amount of silica taken up from solution did not depend on solid to solution ratios, which is in contradiction to adsorption theory, where the amount sorbed from a solution should be proportional to the change of surface area. The most probable explanation is that uptake is not correlated with adsorption, as was interpreted by Klein and Walter (1995), but rather that removal from solution depends on precipitation of silica polymers, where the amount depends on SiO_{2(aq)} concentration in solution.

A separate set of coprecipitation experiments was performed using the constant addition method, where solutions of CaCl₂, Na₂CO₃ and Na₂SiO₃·9H₂O were injected into a reaction vessel. This allowed calcite precipitation and silica coprecipitation rates to be constant. Coprecipitation of silica with calcite was investigated at calcite precipitation rates varying from 0.6 to 13 μmole s⁻¹ m⁻². The amount of coprecipitated SiO₂ increased significantly with increasing silica concentration in the solution as well as with increasing calcite precipitation rate. At maximum rate, SiO₂ uptake was 1.6 μmole/g. Increasing CO₂ partial pressure decreased silica uptake (~20% at low precipitation rates, ~50% at high rates). Such behaviour can be explained either by solid solution formation or by simple capture of silica polymers during calcite precipitation. Our current work aims to make this clear.

Heavy mineral exploration in Guéen area, Sirjan, S of Iran

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Heavy mineral exploration was conducted in Guéen area, Sirjan, southern Iran, as a complement to previous stream-sediment geochemical exploration. During the study, 200 samples were collected from an area of 100 km² for heavy mineral exploration. After fractions processing, sulfide minerals, such as galena, chalcopyrite, chalcocite; and carbonate minerals, such as malachite, cerussite, and smithsonite were detected samples. The results confirm the previous geochemical exploration of polymetallic mineralization in the area. Further exploration lead to recognition of 3 anomalous areas for Pb-Zn-Cu mineralization. These results are in good agreement with previous stream-sediment geochemical exploration for Cu-Au in the region, except that two further prospects were recognized during this survey.