
Crystallization of Iron Oxides on Calcite Surfaces in Static Systems

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Abstract: Iron salts react readily with calcite in oxidizing calcareous environments to produce solid phase Fe-oxides. These reactions represent important processes in aqueous, geologic, and pedogenic environments. In the present investigation, Fe-oxides were precipitated from $\text{Fe}(\text{ClO}_4)_2$ solutions on undisturbed calcite grains in aqueous suspension. In this way it was possible to investigate the sequence of events in the crystallization process. Following an initial precipitation on the calcite grains, a period of slow growth of lepidocrocite was noted wherein 4- μm euhedral platelets formed with uniform orientation perpendicular to the calcite surface. The slow growth and highly crystalline nature of the Fe-oxide product may be partially due to the diffusion barrier formed by the growing oxide crystal mass which influenced rate of movement of HCO_3^- to the dissolved Fe phase and Fe ions and H^+ towards the calcite surface. Upon continued aging, the supernate became noticeably opaque. As the suspended nuclei settled, new surfaces for crystal growth were provided which resulted in somewhat less crystalline lepidocrocite and goethite.

Key Words: Calcite • Crystallization • Goethite • Iron oxide • Lepidocrocite • Synthesis

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