

Abstract Submitted
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Understanding the biological stabilization of ferrihydrite and its transformation to magnetite LYLE GORDON, DERK JOESTER, Northwestern University — The biosynthesis of magnetite in the chiton tooth begins with the formation of ferrihydrite, which is transformed into magnetite. This strategy, which employs crystallization of a precursor into the desired polymorph, is generalized across a range of organisms. However, the specific biological factors that control the transformation are not known. Our results employing atom probe tomography of chiton tooth magnetite revealed the presence of acidic proteins binding sodium and magnesium ions associated with chitin nanofibers. Using a model system we are investigating the influence of organic and inorganic additives on the stabilization of ferrihydrite and the transformation to magnetite. I will discuss the influence of a range of organic and inorganic additives on the formation and transformation of ferrihydrite within the gel. We have found that acidic polymers stabilize ferrihydrite and prevent the formation of the crystalline polymorphs. Transformation of the ferrihydrite to magnetite upon addition of ferrous iron is observed as early as 30 minutes. Taken together, the contribution of these factors to magnetite biomineralization in the presence of an organic matrix will help to elucidate biological mechanisms for nucleation, stabilization, and transformation of iron oxides.

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