

Physicochemical Properties of Phosphate-Doped Ferrihydrite Mineral: Implications in Understanding Ferritin Iron Core and Bacterial Growth

Native ferritin bio-minerals are associated selectively with variable amounts of phosphate depending upon their source, for instance in animals Pi: Fe~ 0.05 - 0.1 and in plant and bacteria Pi: Fe ~ 0.5 - 1.0, this contributes to their structure and properties. Similarly, in nature among various impurities phosphate adsorption on ferrihydrite is verily observed. Therefore, a compare and contrast study of bare and proteinencapsulated phosphate-doped iron minerals may give insights into the critical understanding of selectivity towards phosphate and also its physicochemical properties. So various characterization and analytical studies are performed on phosphate-doped ferrihydrite which closely resembles bio-mineral found in animals, plants, and nature. The doped ferrihydrite having almost equal ratios Pi: Fe showed a proper phase change with very less amount of water of crystallization almost amount of iron release both in the reductive and non-reductive pathway, and also promotes bacterial growth. Hence, the current work justifies nature's selective association of phosphate with native ferrihydrite minerals.

Introduction & Rationale Fe²⁺ Аро Ferritin PO₄^{3′} PO₄³⁻ Ferrihydrite



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Pi:Fe=0 VS Change of Phase Maintained Ratio R= 0 R= 0.1 R= 0.5 (Pi:Fe) Obtained 0.49 0 0.11 ratio(P/Fe)-R' Conclusion Change from crystalline mineral to amorphous mixed phase No water of crystallization in higher Pi: Fe ratios Highest iron release by Pi:Fe = 0.5 & 1.0 both in reductive and nonreductive pathways

Pi: Fe= 0.5 & 1.0 shows favorable bacterial growth in IDM The results are in accordance with the ratios maintained naturally in plants/bacteria and justifies nature's selective association of phosphate

with native ferrihydrite minerals

References & Acknowledgements

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