

Phase Transition in Iron Storage Protein Ferritin

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Abstract : Ferritin is a protein which present in the blood of mammals. It maintains the need of iron inside the body. It has an antiferromagnetic iron core, 7-8 nm in size, which is encapsulated inside a protein cage. The thickness of this protein shell is about 2-3 nm. This protein shell reduces the interaction among particles and make ferritin a model superparamagnet. The major composition of ferritin core is mineral ferrihydrite. The molecular formula of ferritin core is $(\text{FeOOH})_8[\text{FeO}(\text{PO}_3\text{H}_2)]$. In this study, we discuss the phase transition of ferritin. We characterized ferritin using x-ray diffractometer, transmission electron micrograph, thermogravimetric analyzer and vibrating sample magnetometer. It is found that ferritin core is amorphous in nature with average particle size of 8 nm. The thermogravimetric and differential thermogravimetric analysis curves shows mass loss at different temperatures. We heated ferritin at these temperatures. It is found that ferritin core starts decomposing after 390°C. At 1020°C, the ferritin core is finally converted to alpha phase of iron oxide. Magnetization behavior of final sample clearly shows the iron oxyhydroxide core is completely converted to alpha iron oxide.

Keywords : Antiferromagnetic, Ferritin, Phase, Superparamagnetic

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