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Band gap measurements and tunability of ferrihydrite nanocrystals STEPHEN ERICKSON, JOHN COLTON, TREVOR SMITH, RICHARD WATT, Brigham Young University — Ferrihydrite nanocrystals occur naturally within the protein ferritin, a spherical shell with an 8nm wide interior. The nanocrystal core of ferritin can be removed and replaced with a variety of other minerals of a controlled size, allowing for potential to tune their band gap for a variety of applications. However, band gap measurements of even the native ferrihydrite have proven elusive, with reported values of the band gap in the literature ranging from 1.0-3.5 eV. We have resolved these discrepancies using the well-established method of optical absorption spectroscopy, finding evidence of an indirect gap of 2.14 eV and an onset of direct transitions occurring 3.05 eV. A defect-related mid-gap state also exists, with a binding energy of 0.22 eV. Furthermore, we have shown that the band gap can be tuned from (at least) 1.92 - 2.24 eV by controlling the size of the nanocrystals.

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