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Quantitative determination of site-specific magnetic structure in TEM

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Determining the magnetic structure of material on a nanometer scale is fundamental for understanding its nano-scale magnetic property and developing nano-scale magnetic devices. Site-specific electron energy-loss magnetic chiral dichroism (site-specific EMCD[1],[2]) method is come up with to get the crystallographic site-specific magnetic information of nanostructures. By constructively using the dynamical diffraction conditions in EMCD experiments, we experimentally achieve the crystallographic site-specific magnetic structure of a nanostructure of NiFe2O4 as an example in transmission electron microscope, with its site-specific magnetic circular dichroism spectra, and its site-specific spin/orbital magnetic moments extracted. The site-specific EMCD method shows its unique capability for solving the crystallographic site-specific magnetic structure on nano-scale, compared with X-ray magnetic circular dichroism and neutron diffraction. This work may benefit the research and application of magnetic materials on a nanometer scale. Acknowledgement: This work is financially supported by National 973 Project of China (2009CB623701) and Chinese National Nature Science Foundation (11374174, 51390471). This work made use of the resources of the Beijing National Center for Electron Microscopy.

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