



X-ray Magnetic Circular Dichroism in rock magnetism - Application to the study of biogenic magnetite

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X-ray circular magnetic dichroism (XMCD) is a spectroscopy method which measures the variation of absorption coefficient with the direction of light polarization when a magnetic field is applied. Besides chemical selectivity, XMCD is also sensitive to crystal field symmetries, and therefore to the site geometry of atoms. When applied to magnetite, XMCD measurements can give access to the distribution of the three cations: Fe²⁺ in octahedral sites, Fe³⁺ in octahedral sites and Fe³⁺ in tetrahedral sites. We used XMCD measurements to compare the Fe²⁺ / Fe³⁺ ratio in nanomagnetite chemically produced from lepidocrocite and nanomagnetite biogenically produced by the iron-reducing bacterium *Shewanella putrefaciens*. We showed that the biotic nanomagnetite contained a higher amount of Fe²⁺ than the abiotic nanomagnetite.