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**Magnetic domains in $Nd_2Fe_{14}B$ on various length scales** A. KREYSSIG, Ames Laboratory; IFP, TU Dresden, Germany, R. PROZOROV, Ames Laboratory; Dept. of Physics and Astronomy, Iowa State Univ., C. DEWHURST, ILL Grenoble, France, P.C. CANFIELD, Ames Laboratory; Dept. of Physics and Astronomy, Iowa State Univ., R.W. MCCALLUM, Ames Laboratory, A.I. GOLDMAN, Ames Laboratory; Dept. of Physics and Astronomy, Iowa State Univ. — Detailed knowledge about the structure of ferromagnetic domains provides a link between microscopic physics and macroscopic magnetic response. In the well known, and already widely used compound, $Nd_2Fe_{14}B$, the dimension, shape and arrangement of magnetic domains are still in discussion due to lack of suitable methods to study magnetic domain structures in the bulk and due to the geometric complexity observed on the surface. Here, we demonstrate that domain patterns revealed by quantitative Kerr and Faraday microscopy, exist well below the surface as detected by small angle neutron scattering. At room temperature, the easy-axis magnetic anisotropy yields very complex structures of domains on various length scales. In contrast, the cone-like magnetic anisotropy below 135 K reduces the complexity of the domain arrangement to a more regular and anisotropic structure of much larger domains. As a consequence the bulk magnetization increases due to the significant volume reduction of the domain walls. – The support by U.S. DOE (DE-AC02-07CH11358), DFG (SFB463) and the Alfred P. Sloan foundation is acknowledged.

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