METHODS

Standard petrographic thin sections were prepared from bulk rock samples. Structurally
damaged and semi-amorphous material left behind from the standard polishing was
chemically and mechanically removed during a final polish in Buehler Mastermet®, a
suspension of fine (0.06 micron) amorphous SiO₂ particles in a high pH (9.8) aqueous base,
then sonicated in distilled water for one minute prior to examination.

Atomic and magnetic force microscopy images were collected on a Digital Instruments
(DI) Dimension 3000 with standard DI magnetic force etched silicon probe (MESP) tips at
the Magnetic Microscopy Center at the University of Minnesota. The MESP tip is a single
beam silicon cantilever 225 µm long, with a resonant frequency of 60-100 kHz, a spring
constant of 1-5 N/m, and tip radius of curvature of 25-50 nm. Topographic images were
collect in dynamic mode (TappingMode™), while magnetic images were collected in
LiftMode™ with a constant tip-sample separation height of 30 nm.

Images and quantitative composition data were collected using a JEOL 200CX analytical
electron microscope at the National Center for Electron Microscopy at the Ernest Orlando
Lawrence Berkeley National Laboratory. The microscope was operated with an
accelerating voltage of 200 kV. Compositional data was collected with a Kevex EDX
detector and analyzed with Emispec software.
Orientation information on selected samples was obtained using the Electron Backscatter Diffraction (EBSD) technique at the University of California, Berkeley Texture Laboratory using facilities and methods described by Feinberg et al. (2004).

Supplemental Figure 1. Figure showing orientation relationship of the ulvöspinel walls to the crystallographic orientation of the magnetite blocks.

Supplemental Figure 2. Images of an inclusion (A) before (B), during (C), and after (D) exposure to 72.5 mT DC fields. Fields up to 72.5 mT were generated by a solenoid and monitored using a Hall probe. Dashed boxes show common areas between the images.
Supplemental Figure 1.