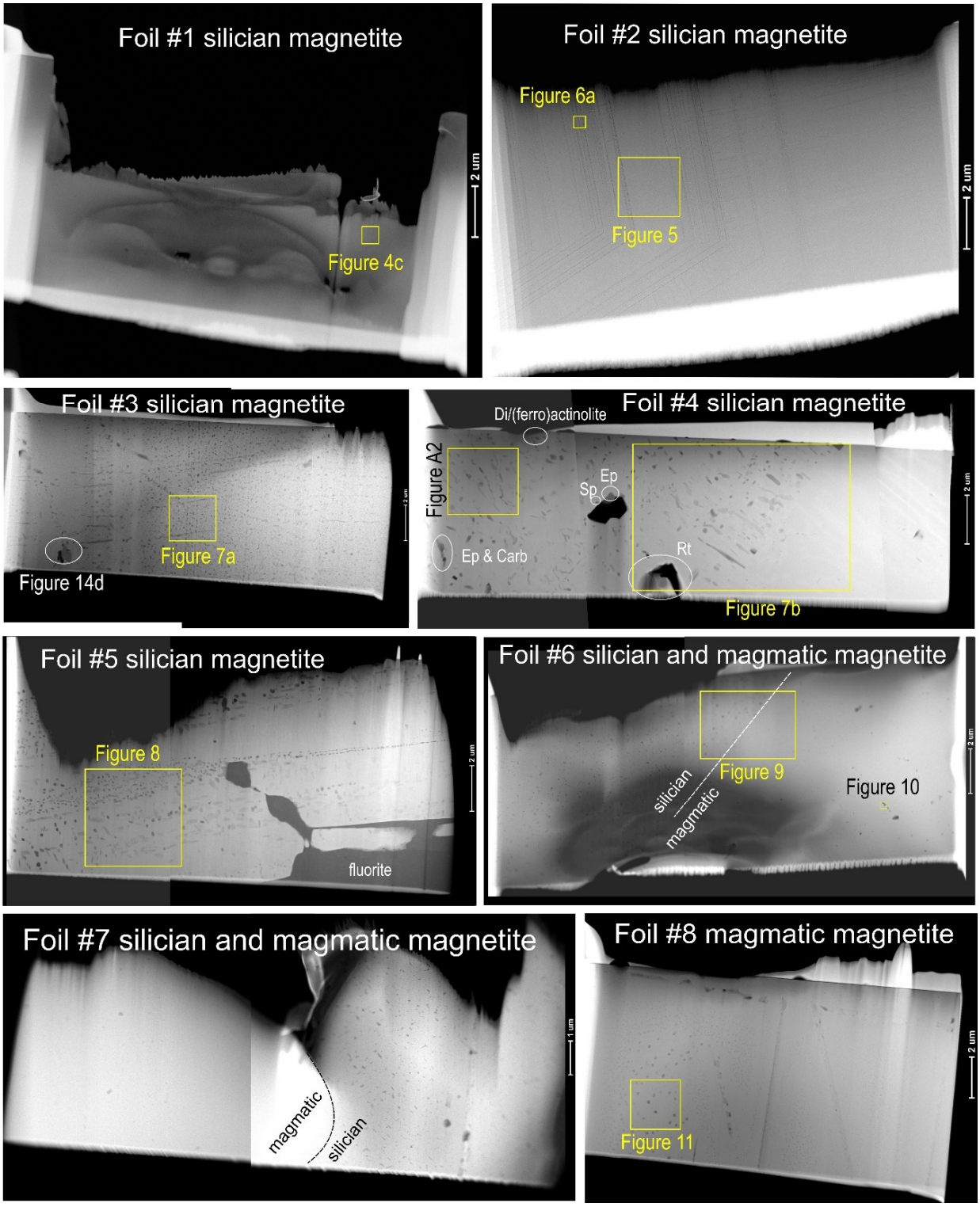

Figure S1. HAADF STEM images showing the 8 foils (Table 1) analysed in this study and the location of element maps as marked. Location for STEM EDS maps are also marked. Abbreviations: Carb-carbonate; Di-diopside; Ep-epidote; Rt-rutile.

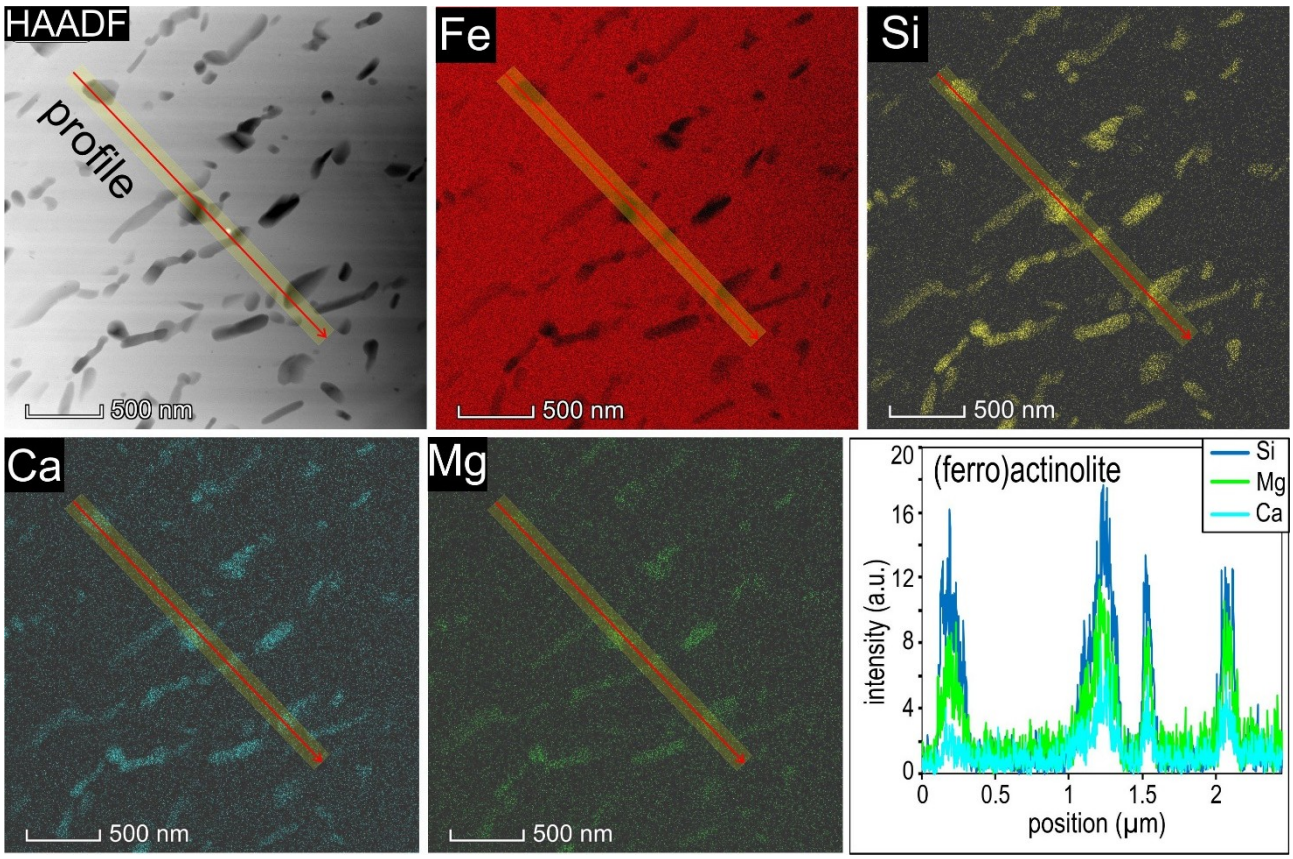

Figure S2. HAADF STEM image, EDS maps and profile showing calc-silicate inclusions in magnetite (foil #4).

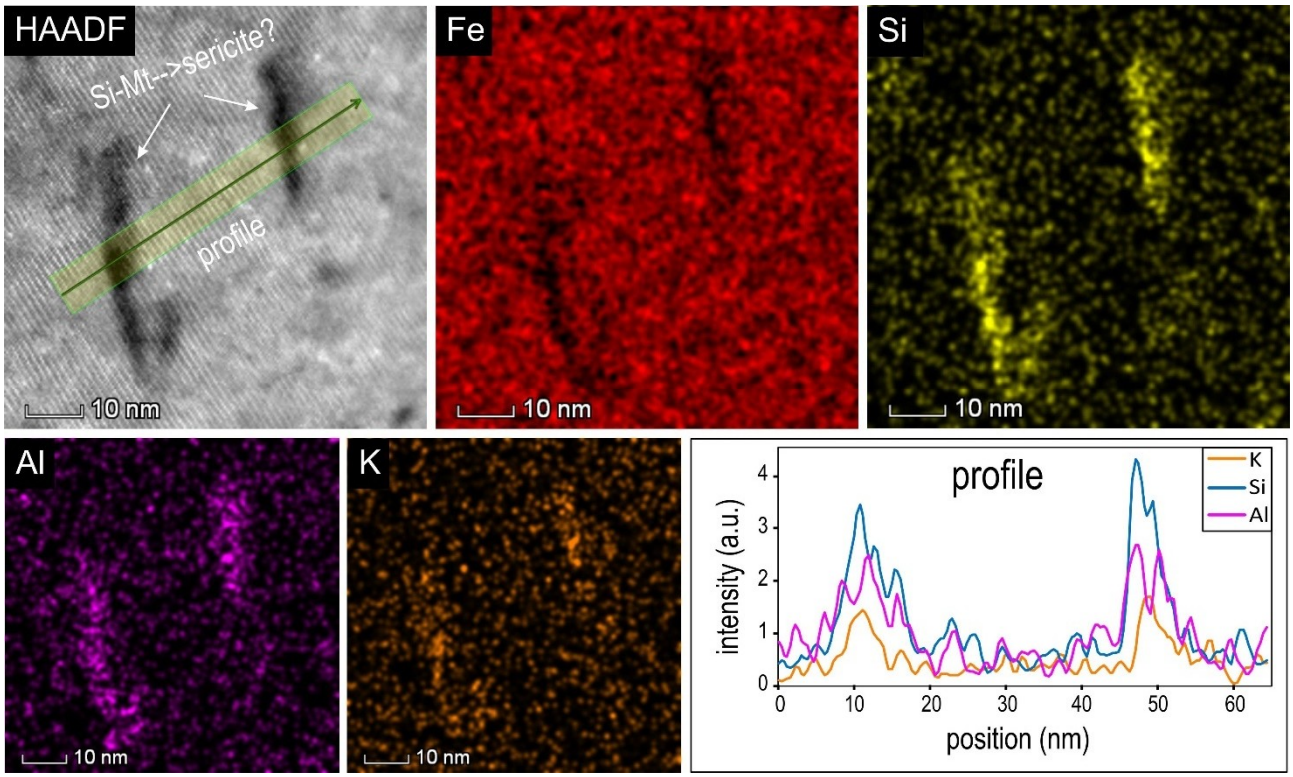

Figure S3. HAADF STEM image, EDS maps and profile showing Al- and K-bearing Si-Fe-nanoprecipitates (Si-Mt) in magnetite (foil #5)

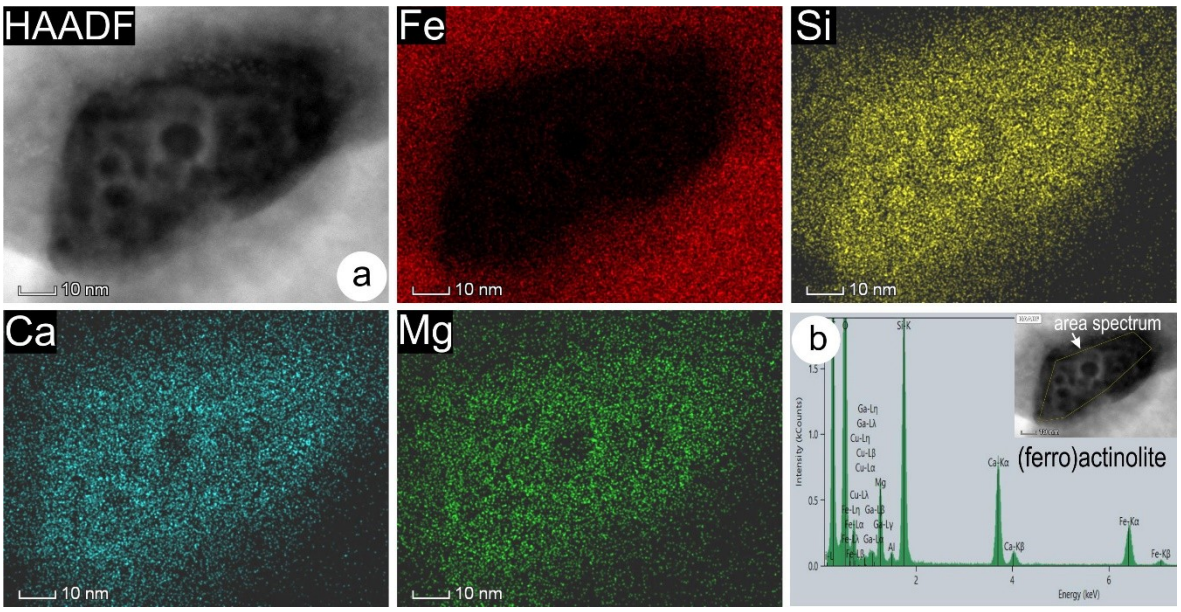

Figure S4. HAADF STEM image, EDS maps and spectrum showing (ferro)actinolite inclusion in magnetite (foil #4).

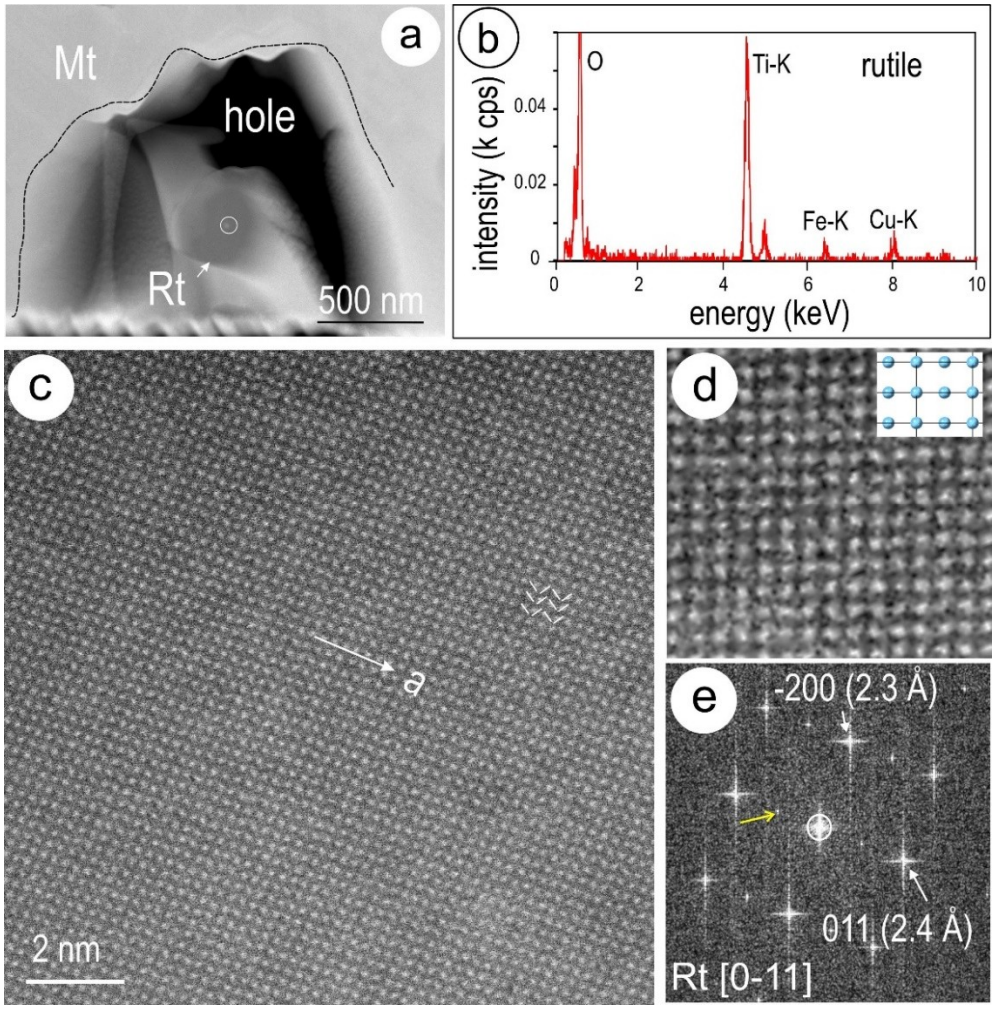

Figure S5. HAADF STEM images (a, c, d), spectrum (b) and FFT (e) showing rutile (Rt) on [0-11] zone axis (foil #4). Blue circles in the crystal structure model represent Ti atoms. Yellow arrow in (e) shows satellite reflections attributable to twinning along *a* axis, as marked by white lines in (c). Mt-magnetite. The hole is most likely produced during FIB milling.

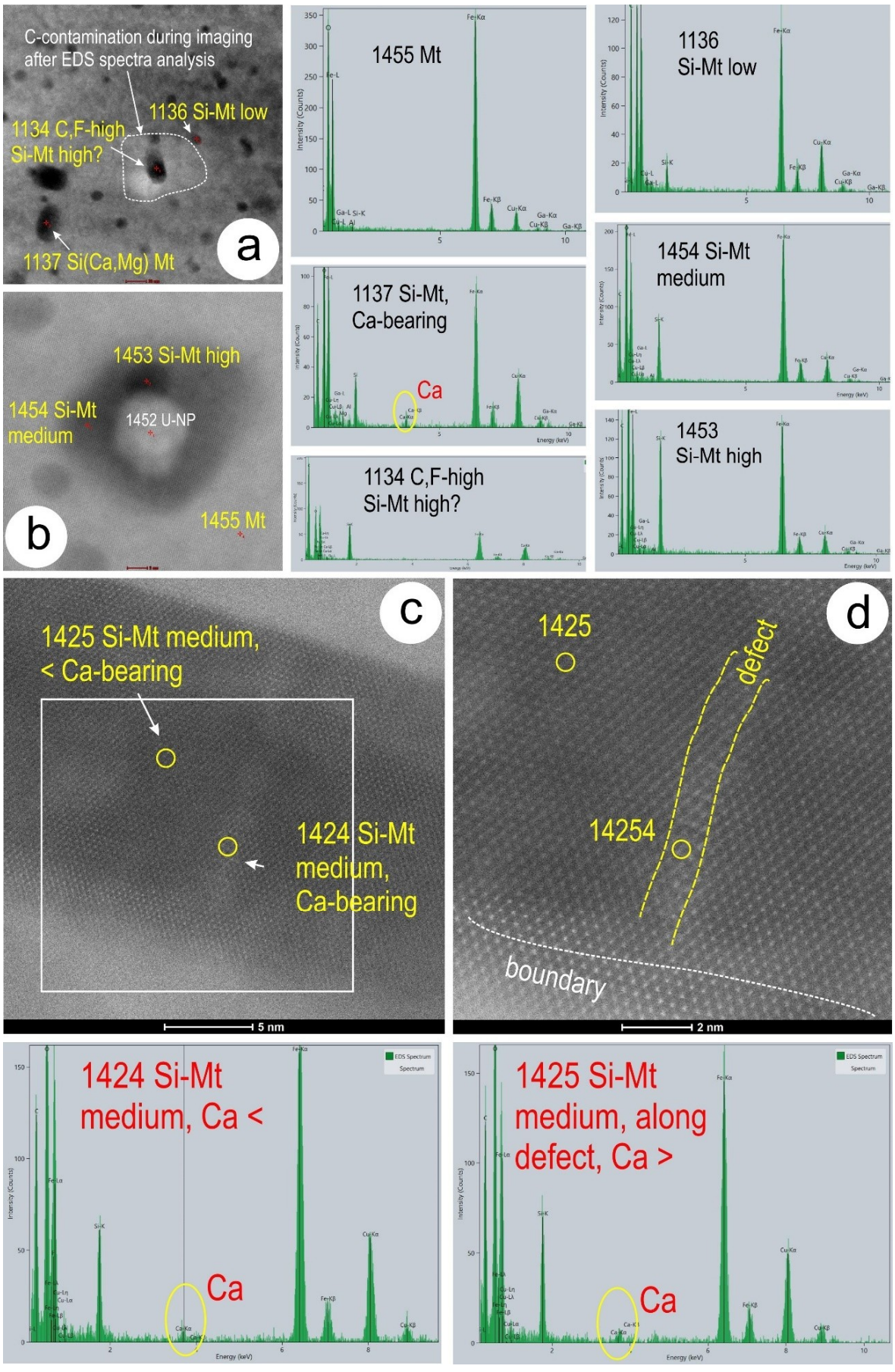

Figure S6. HAADF STEM images and EDS spectra showing variation in composition of Si-Fe-blebs (Si-Mt) from coarse magnetite (Mt) (foil #1).

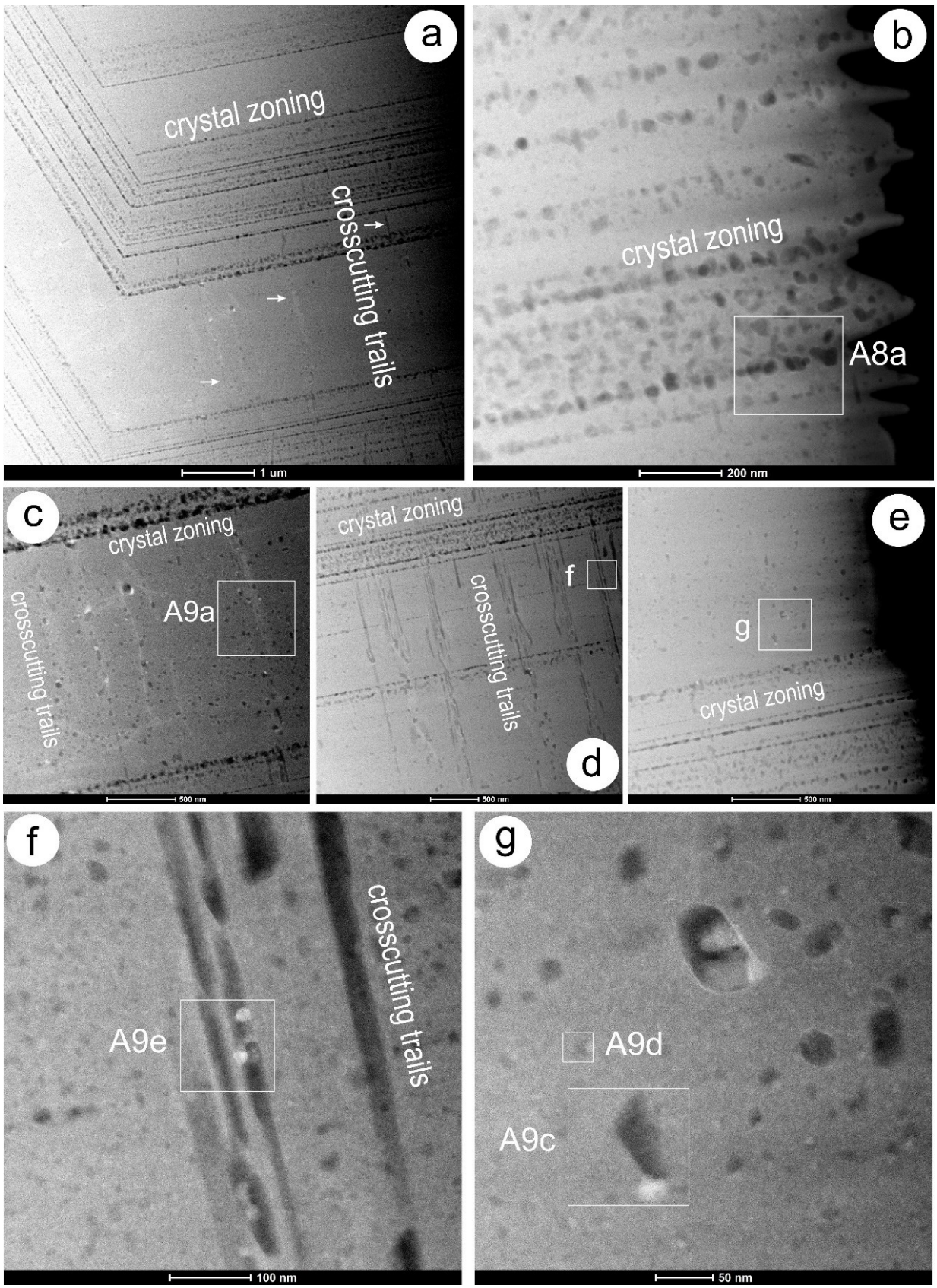

Figure S7. HAADF STEM images showing textures of silician magnetite of medium-sized grains (foil #2).

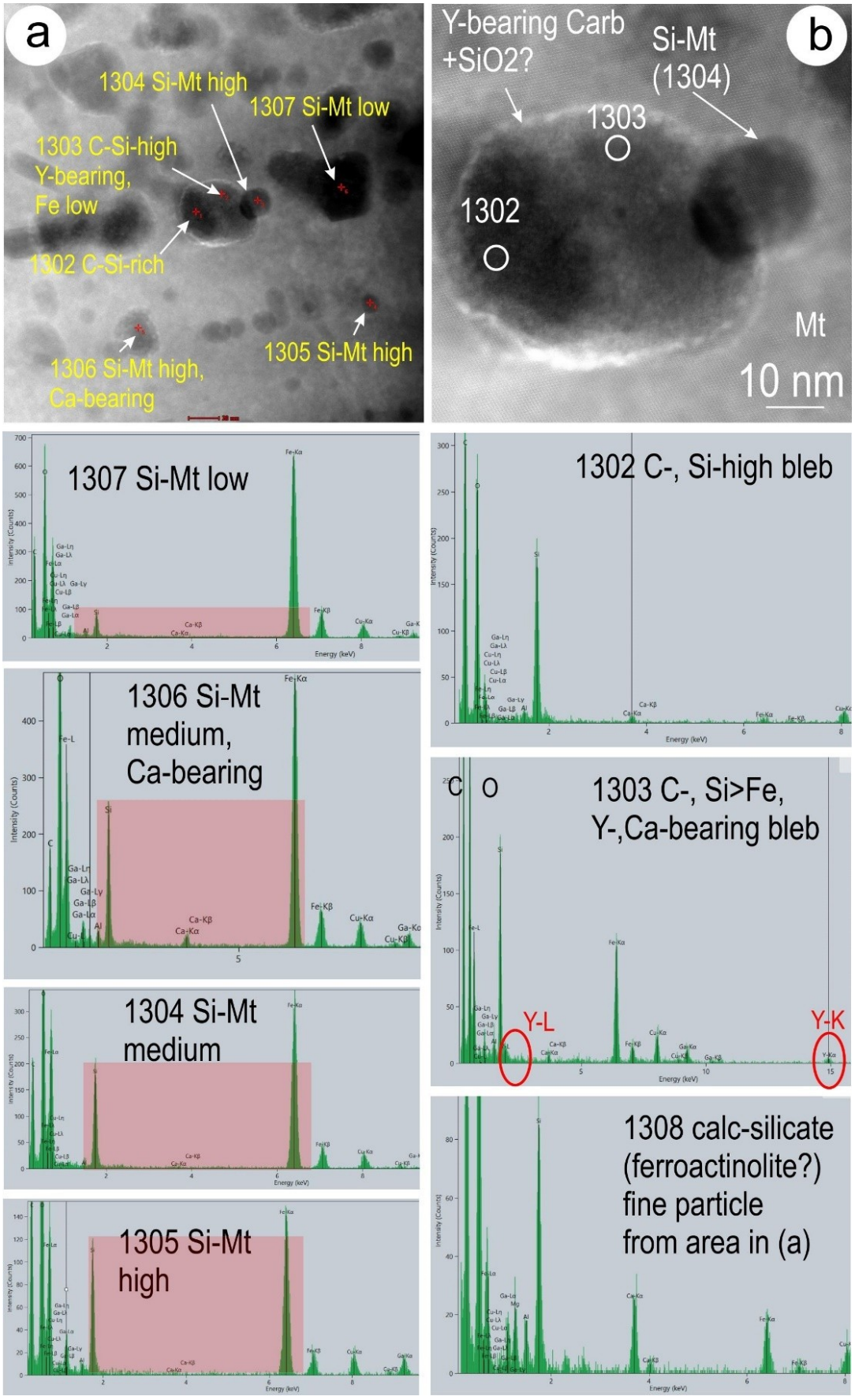

Figure S8. HAADF STEM images and EDS spectra showing variation in composition of Si-Fe-blebs (Si-Mt) along crystal zoning in medium-sized magnetite (Mt) (foil #2).

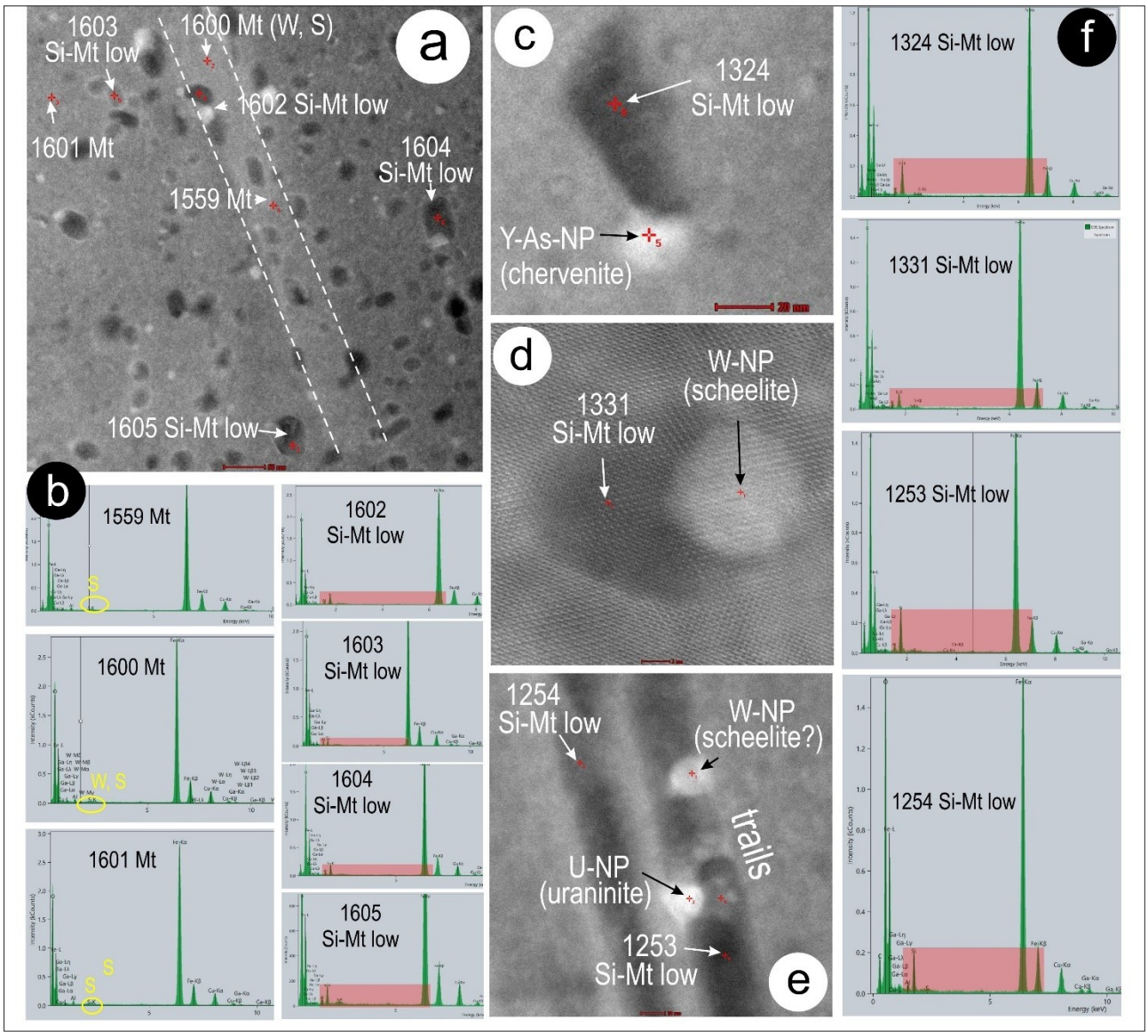

Figure S9. HAADF STEM images and EDS spectra showing variation in composition of Si-Fe-blebs (Si-Mt) along trails in medium-sized magnetite (Mt) (foil #2).