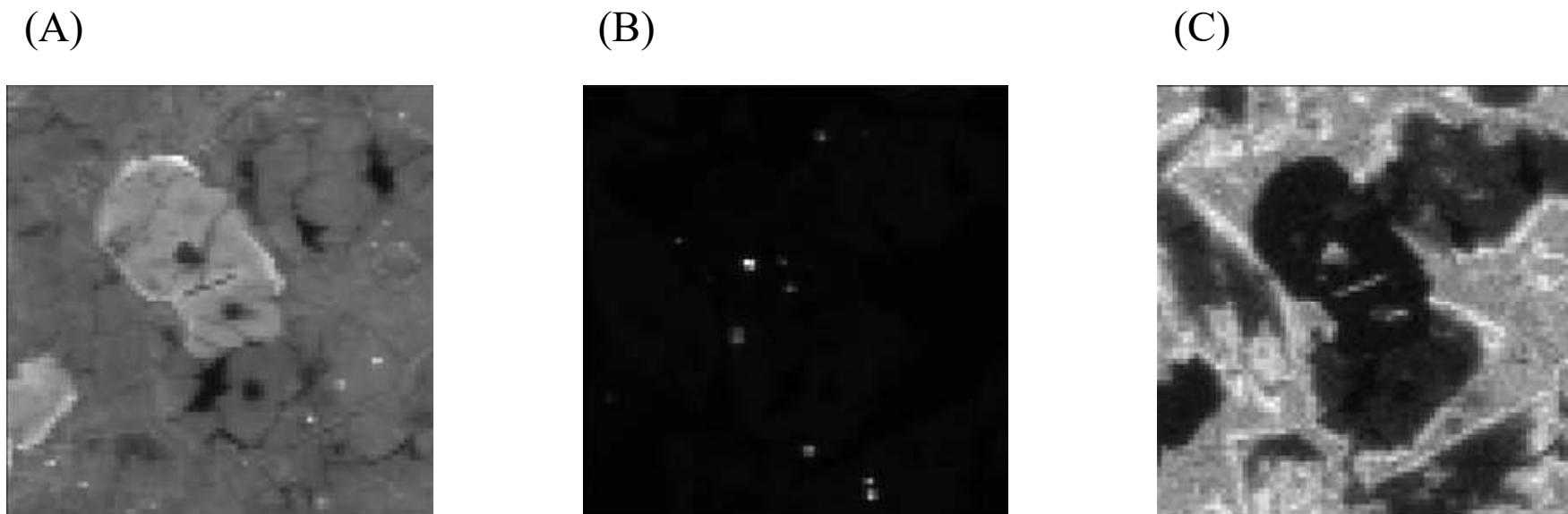
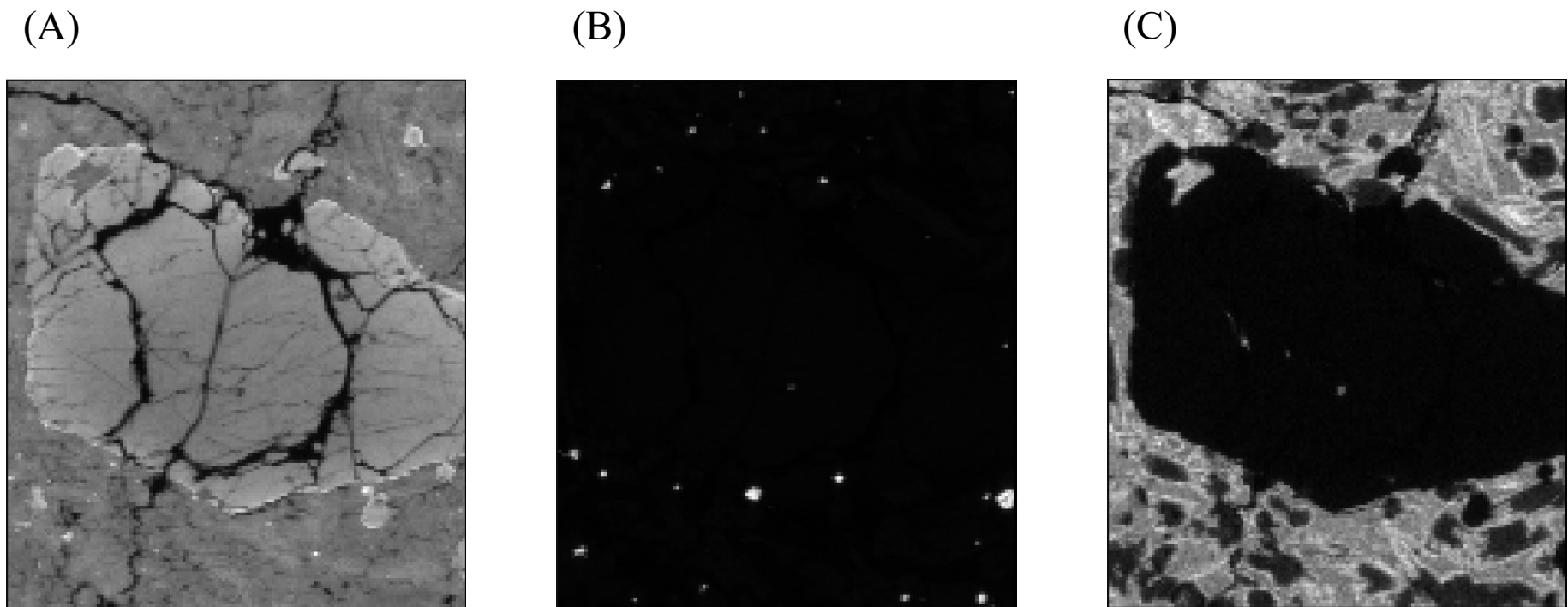


Supplementary Fig. 1.



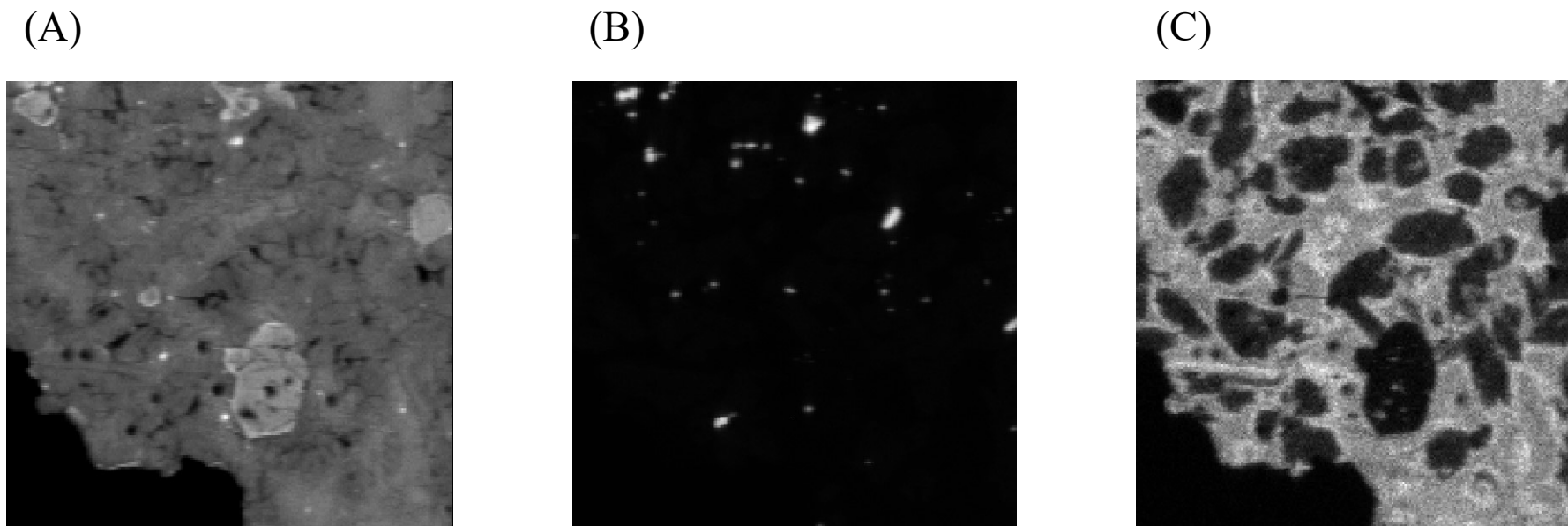
Supplementary Fig. 1. XRF mapping of (A) Fe, (B) Cr, and (C) Ca at the same area as Fig. 3A.

Supplementary Fig. 2.



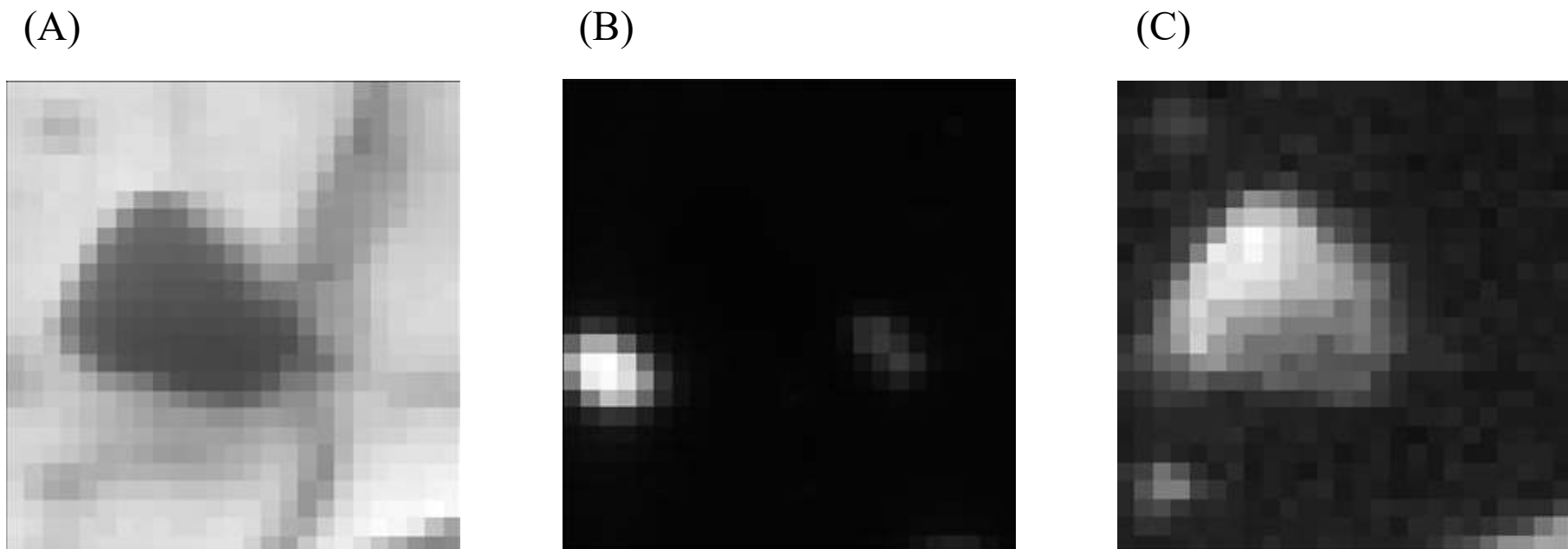
Supplementary Fig. 2. XRF mapping of (A) Fe, (B) Cr, and (C) Ca at the same area as Fig. 3B.

Supplementary Fig. 3.



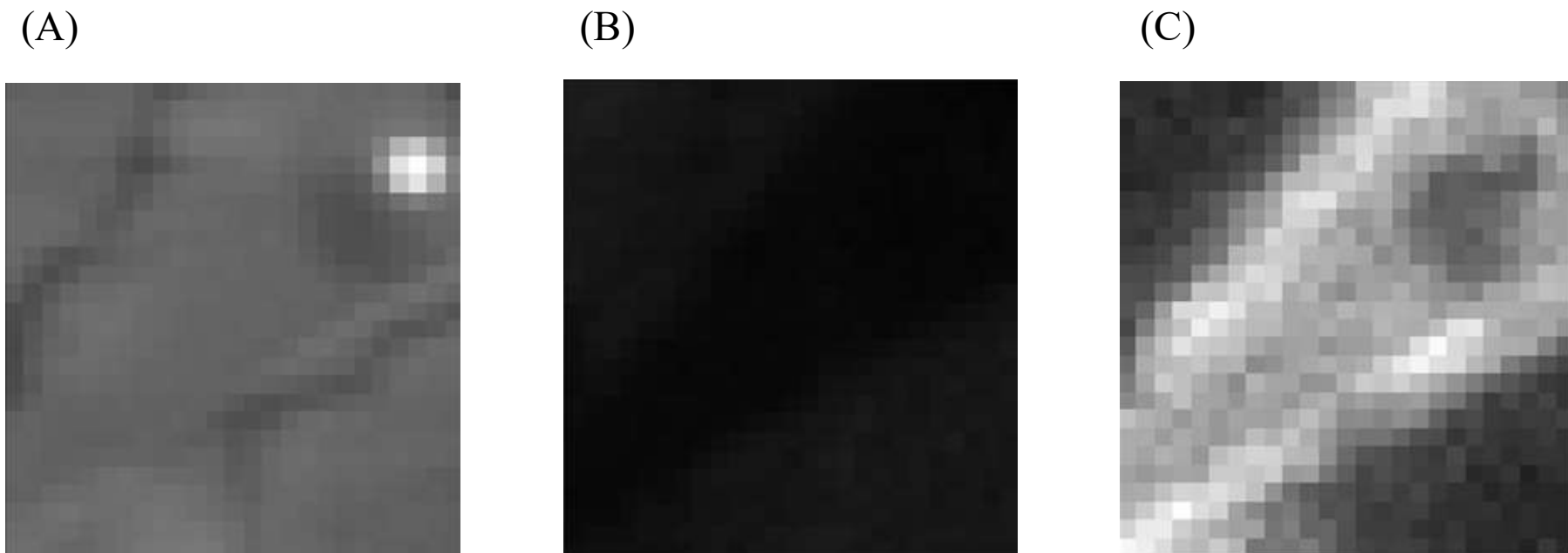
Supplementary Fig. 3. XRF mapping of (A) Fe, (B) Cr, and (C) Ca at the same area as Fig. 3C.

Supplementary Fig. 4.



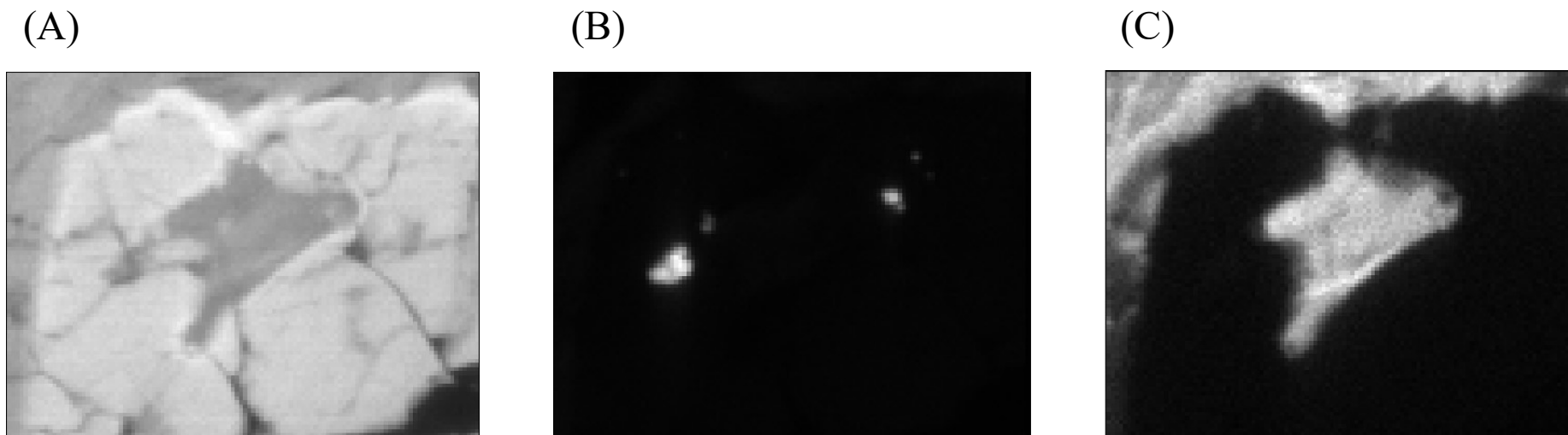
Supplementary Fig. 4. XRF mapping of (A) Fe, (B) Cr, and (C) Ca at the same area as Fig. 3D.

Supplementary Fig. 5.



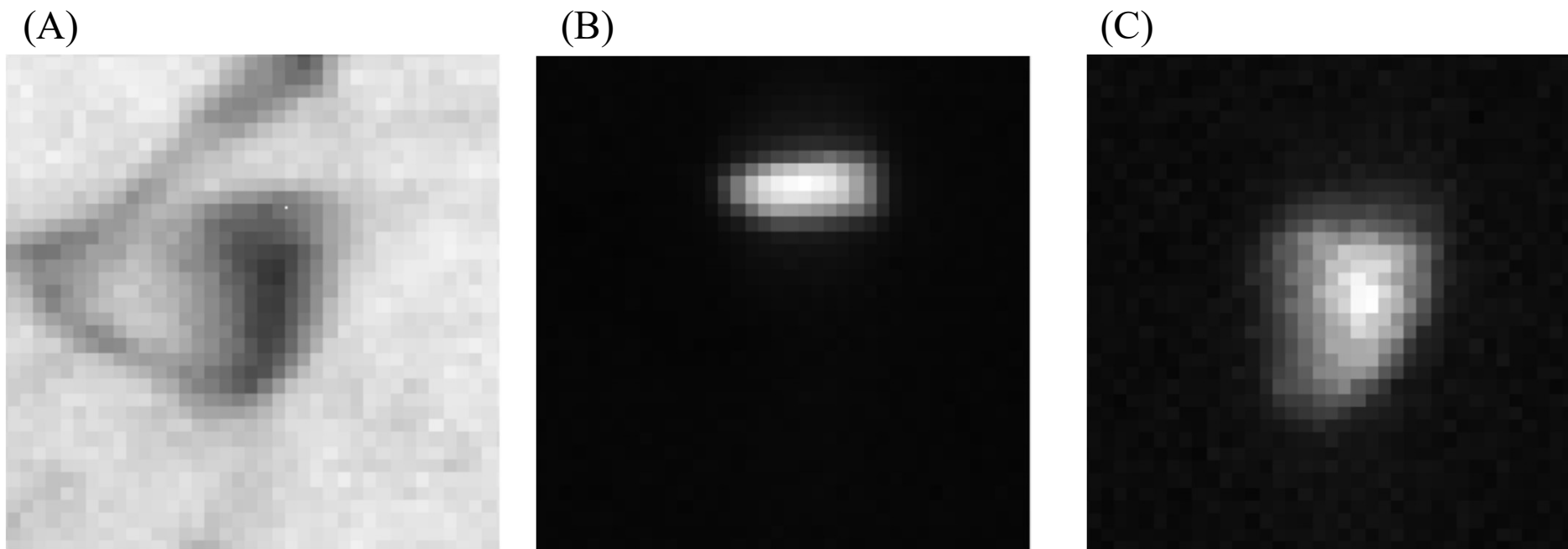
Supplementary Fig. 5. XRF mapping of (A) Fe, (B) Cr, and (C) Ca at the same area as Fig. 3E.

Supplementary Fig. 6.



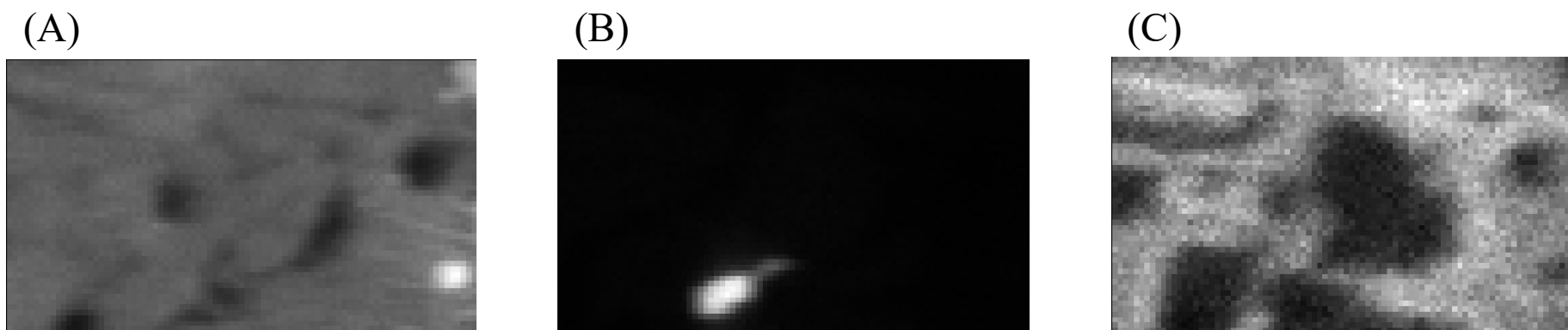
Supplementary Fig. 6. XRF mapping of (A) Fe, (B) Cr, and (C) Ca at the same area as Fig. 3F.

Supplementary Fig. 7.



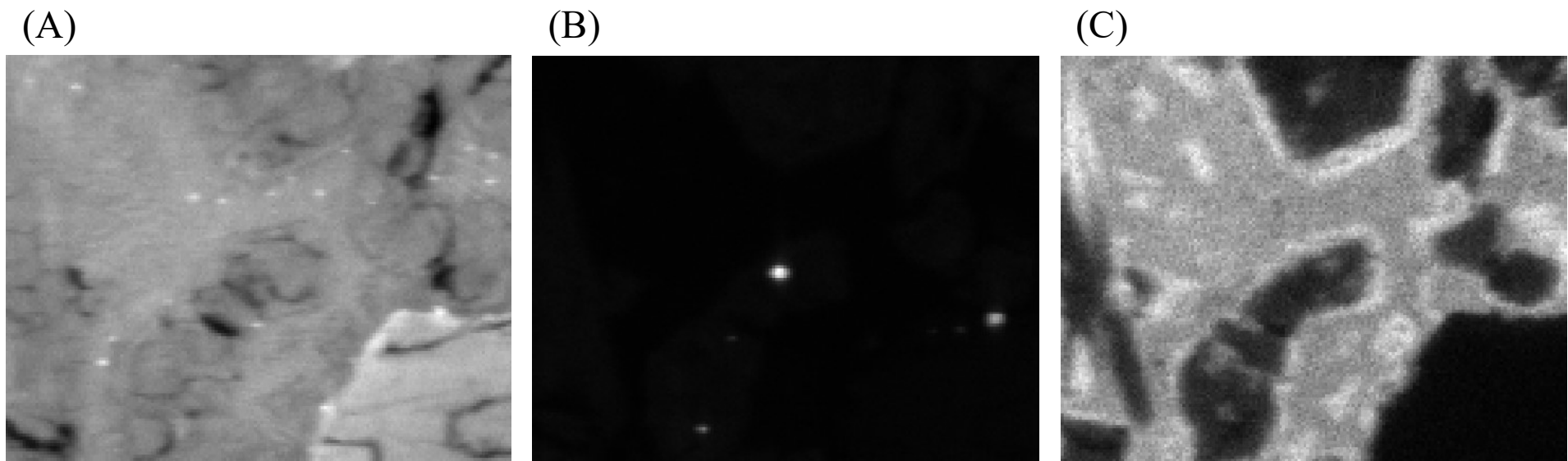
Supplementary Fig. 7. XRF mapping of (A) Fe, (B) Cr, and (C) Ca at the same area as Fig. 3G.

Supplementary Fig. 8.



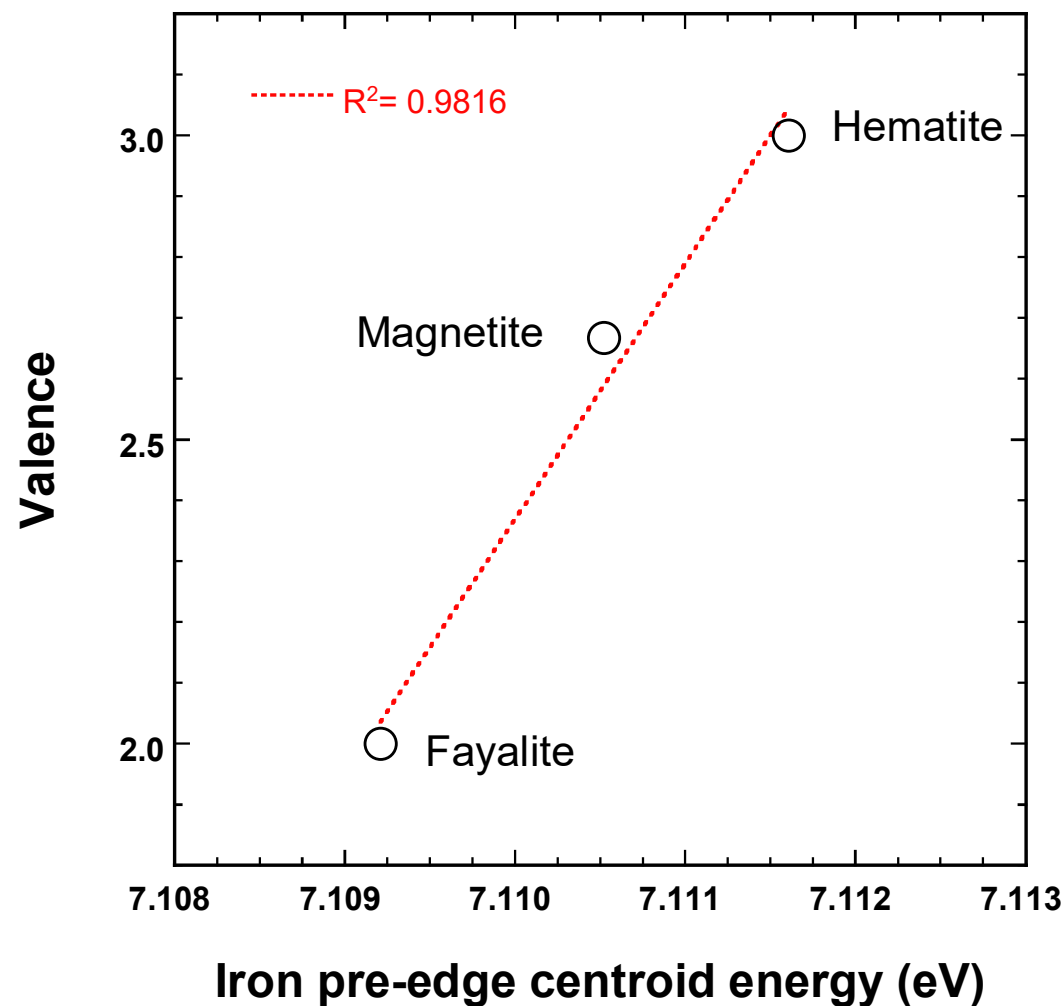
Supplementary Fig. 8. XRF mapping of (A) Fe, (B) Cr, and (C) Ca at the same area as Fig. 3H.

Supplementary Fig. 9.



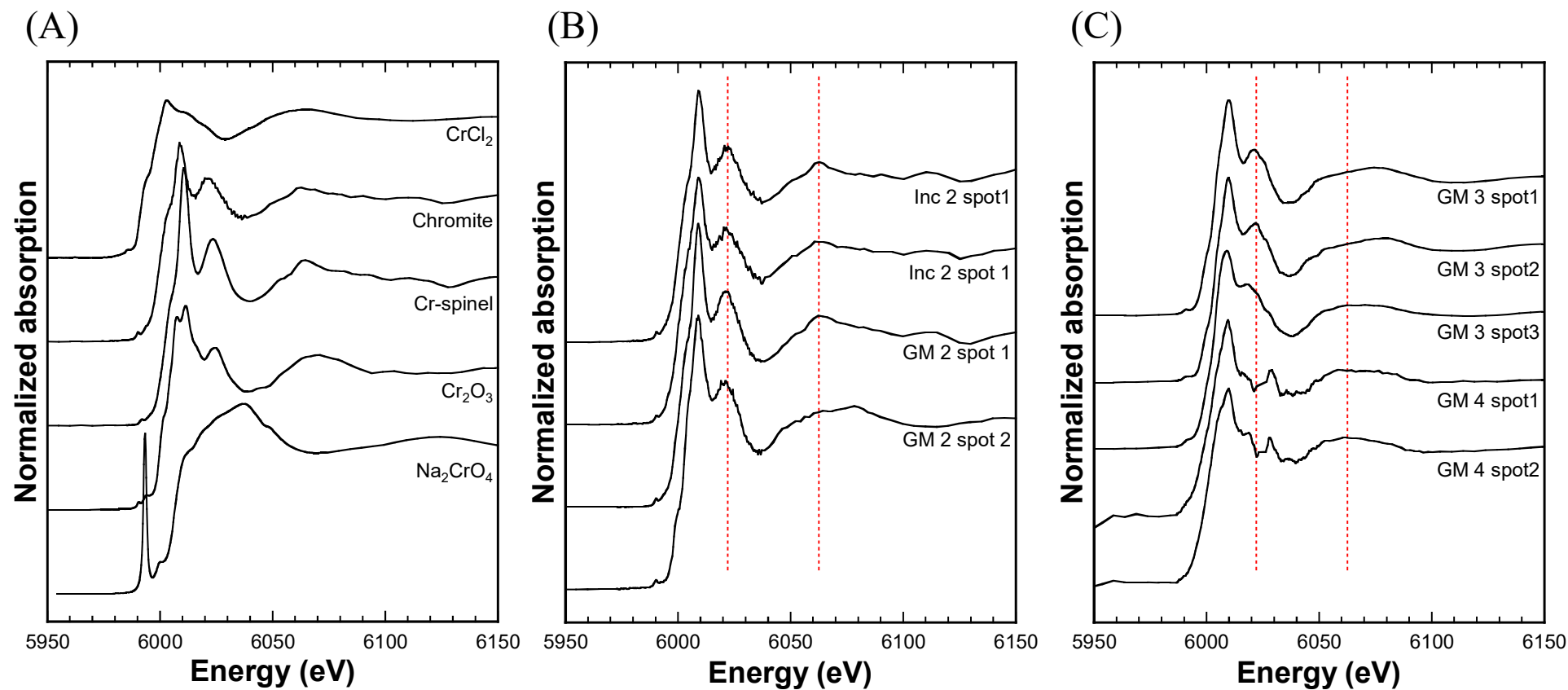
Supplementary Fig. 9. XRF mapping of (A) Fe, (B) Cr, and (C) Ca at the same area as Fig. 3I.

Supplementary Fig. 10.



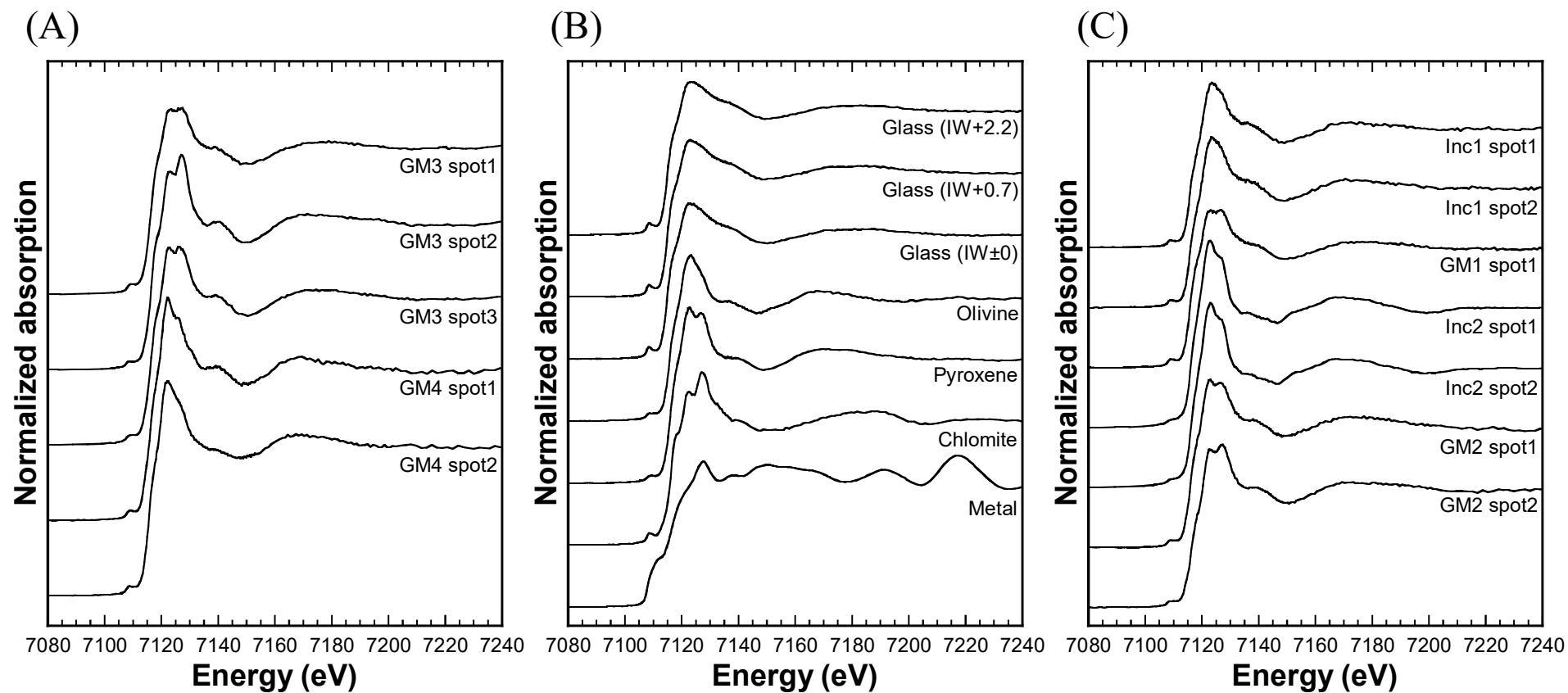
Supplementary Fig. 10. The relationship between pre-edge centroid energy and valence state. The dashed line shows regression line used as a calibration curve for Y98.

Supplementary Fig. 11.



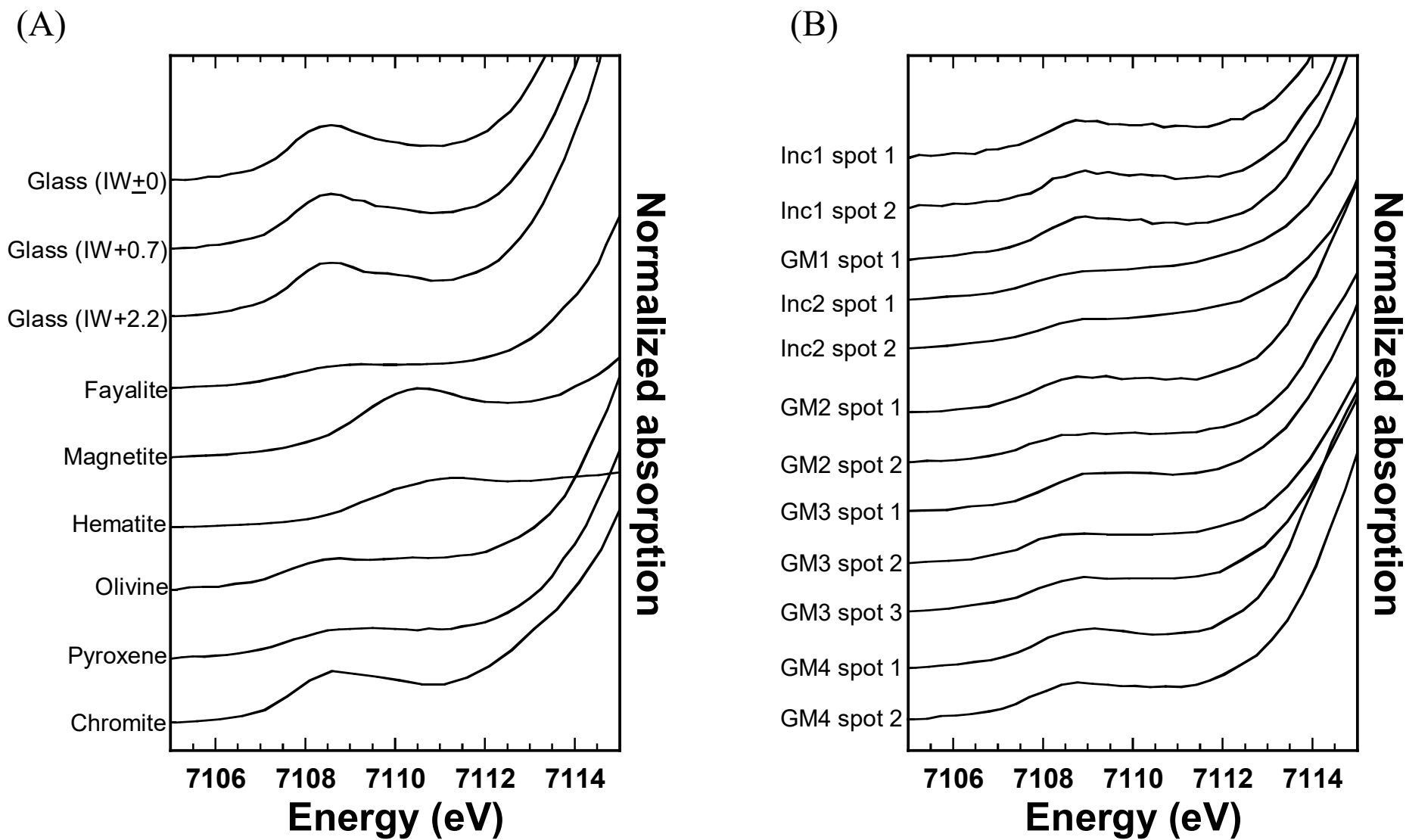
Supplementary Fig. 11. Chromium K-edge XANES spectra of (A) reference materials, and (B) and (C) μ -XANES analytical spots.

Supplementary Fig. 12.



Supplementary Fig. 12. Iron K-edge XANES spectra of (A) reference materials, and (B) and (C) μ -XANES analytical spots.

Supplementary Fig. 13.



Supplementary Fig. 13. Iron K-edge pre-edge spectra of (A) reference materials and (B) μ -XANES analytical spots.