

Upconversion properties of Lanthanide-Organic Frameworks and How to Track Ammunitions Using these Materials.

Electronic Supporting Information

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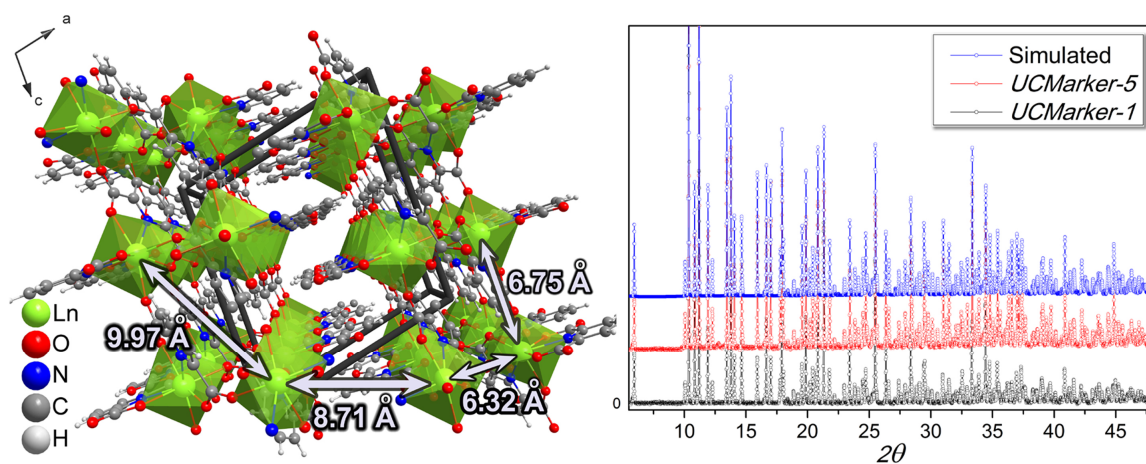


Figure S1 – Crystallographic structure of *UCMarkers* and high resolution synchrotron X-rays diffraction patterns for *UCMarker-1* (black line), *UCmarker-5* (red line) and simulated via PowderCell.[1]

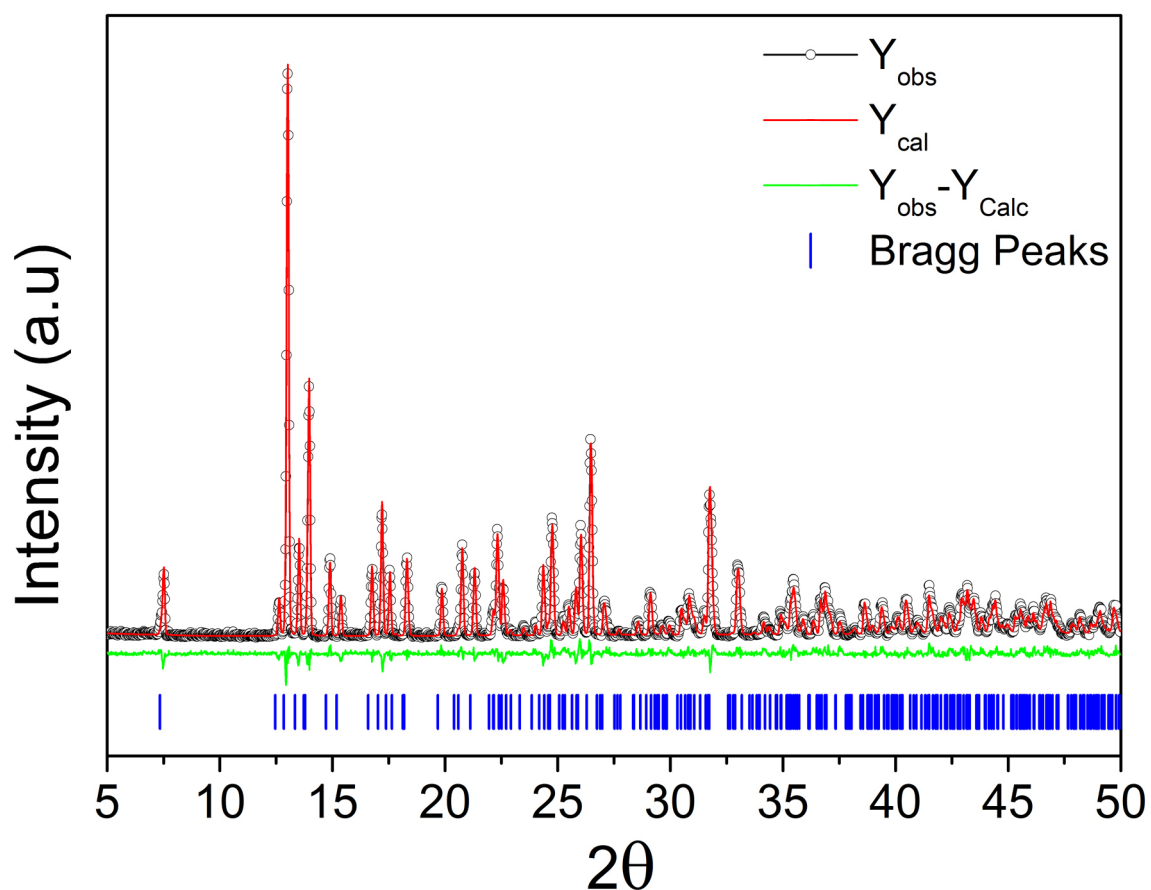


Figure S2 – Final Rietveld refinement of *UCMarker-2*. Observed data points are indicated as black circles, the best-fit profile (upper trace) and the difference pattern (lower trace) are drawn as solid red and green lines, respectively. Blue vertical bars indicate the angular positions of the allowed Bragg reflections. Reliability Factors for refinement: R_p : 10.25; R_{wp} : 14.00; χ^2 : 2.38; R_F^2 : 8.26.

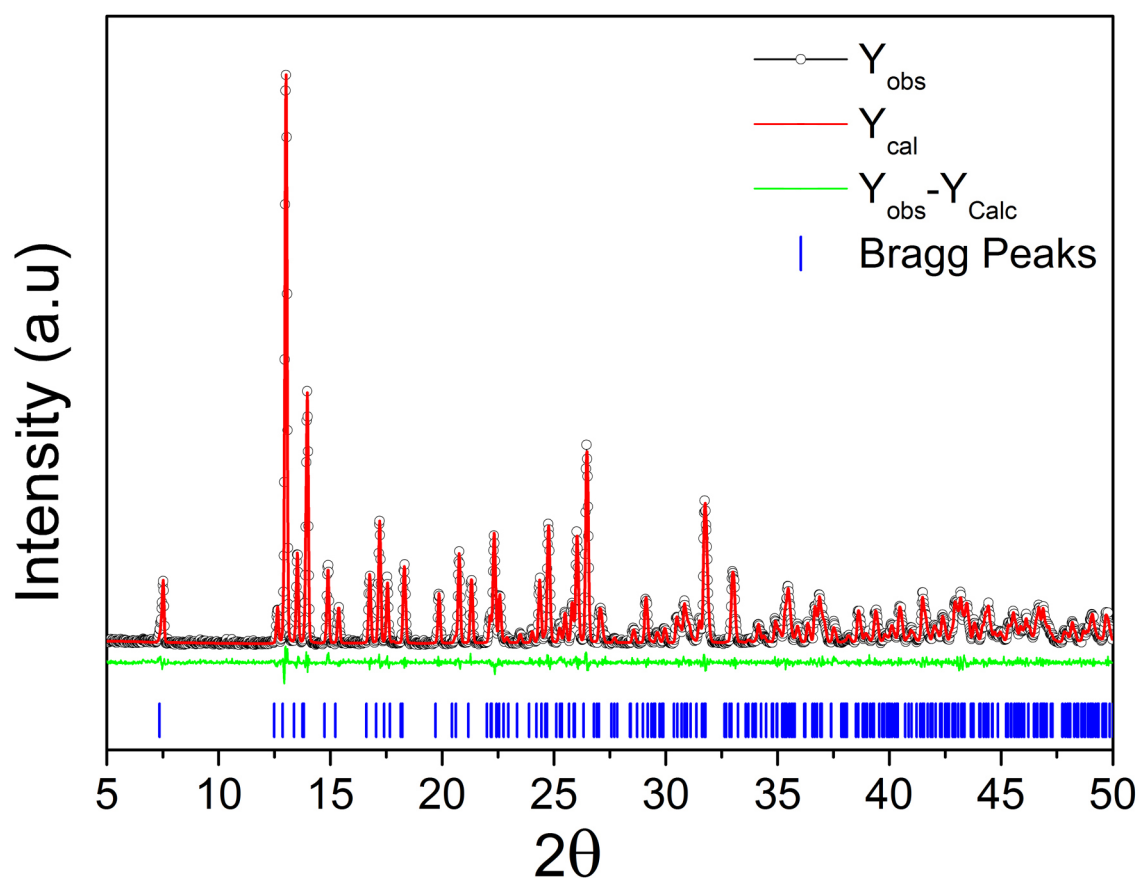


Figure S3 – Final Rietveld refinement of *UCMarke-3*. Observed data points are indicated as black circles, the best-fit profile (upper trace) and the difference pattern (lower trace) are drawn as solid red and green lines, respectively. Blue vertical bars indicate the angular positions of the allowed Bragg reflections. Reliability Factors for refinement: R_p : 7.80; R_{wp} : 11.60; χ^2 : 1.73; R_F^2 : 3.02.

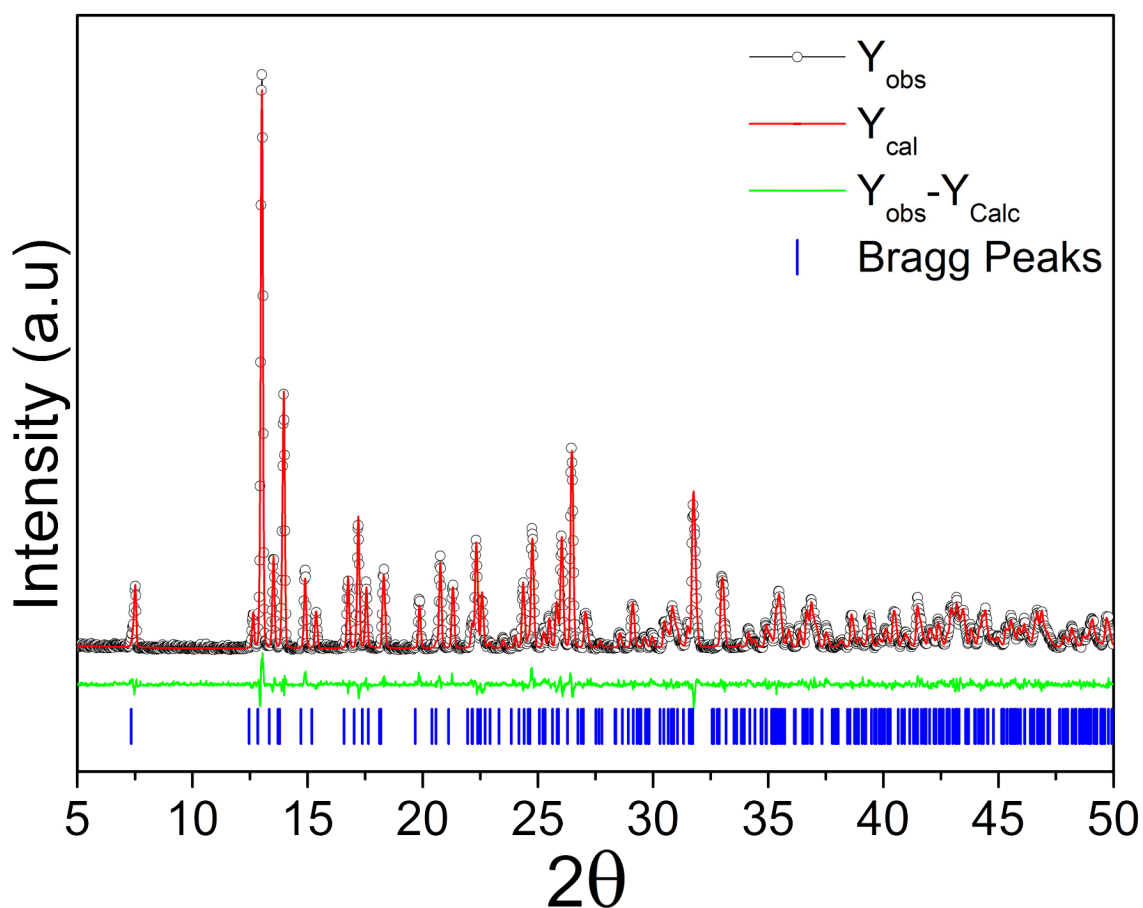


Figure S4 – Final Rietveld refinement of *UCMarke-4*. Observed data points are indicated as black circles, the best-fit profile (upper trace) and the difference pattern (lower trace) are drawn as solid red and green lines, respectively. Blue vertical bars indicate the angular positions of the allowed Bragg reflections. Reliability Factors for refinement: R_p : 9.35; R_{wp} : 12.84; χ^2 : 2.00; R_F^2 : 5.05.

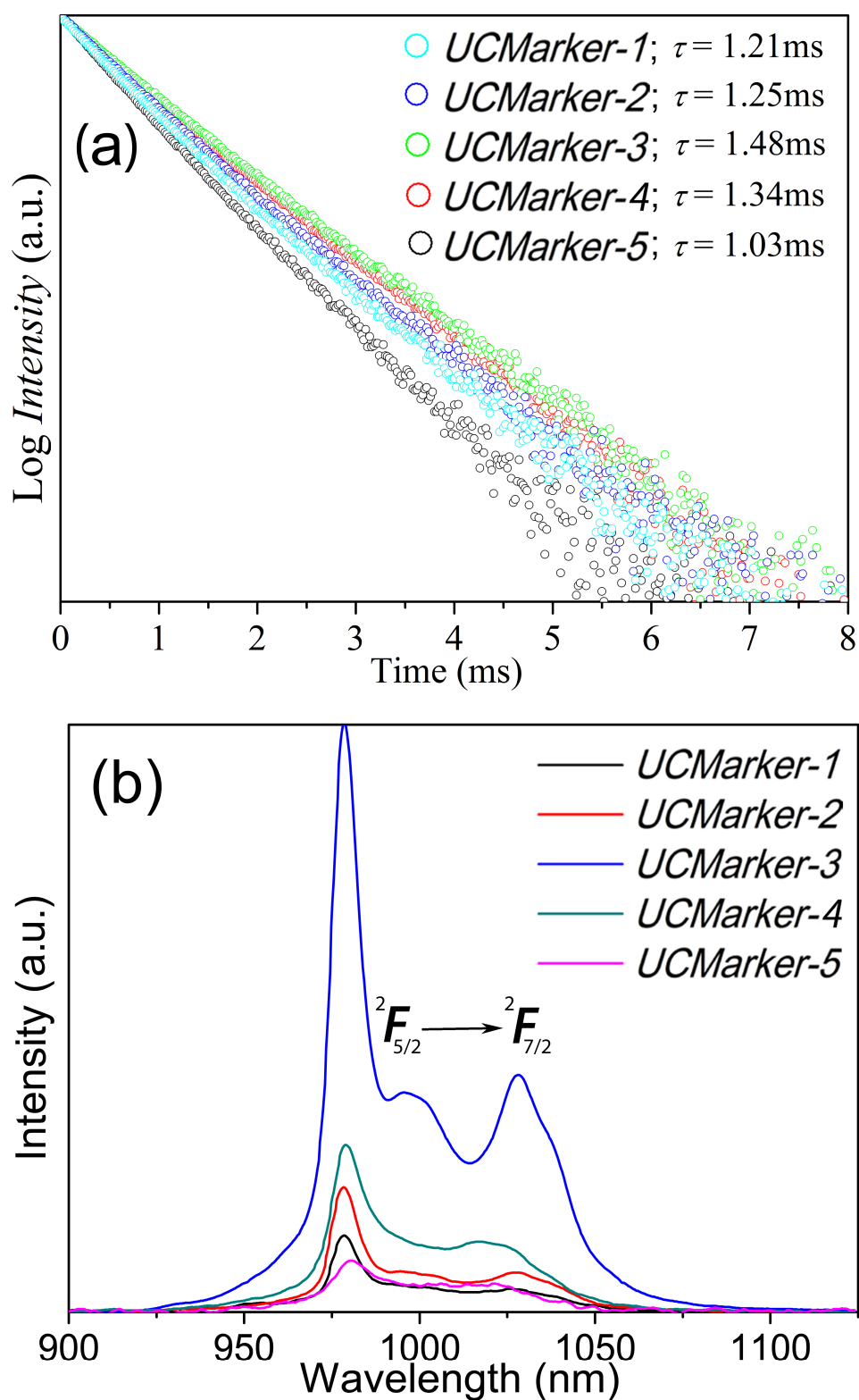


Figure S5 – (a): Emission decay patterns of *UCMarkers* and lifetimes upon excitation at 355 nm; (b): Room temperature NIR emission spectra of *UCMarkers* upon excitation at 325 nm.

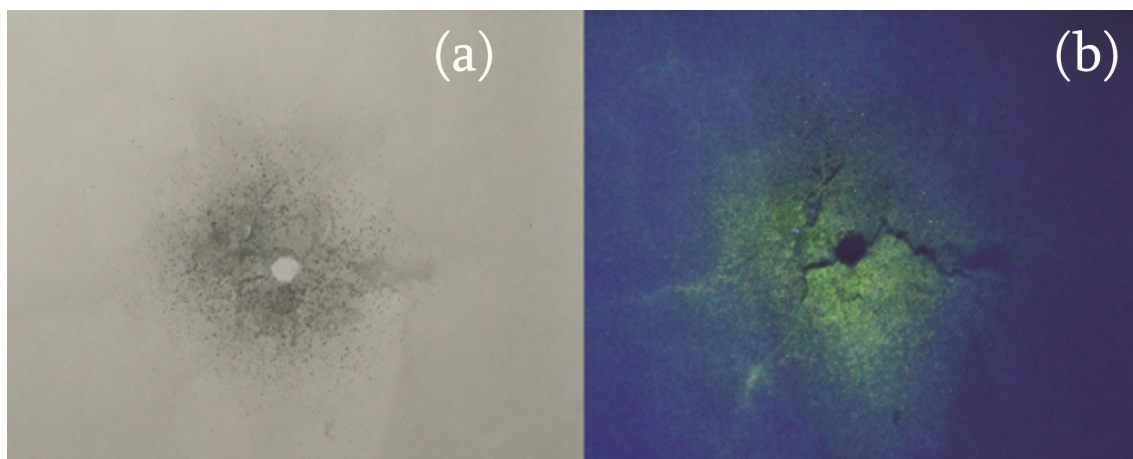


Figure S6 –*UCMarker-1* containing GSR deposited on the targets. (a) no UV irradiation (b) under UV lamp irradiation.

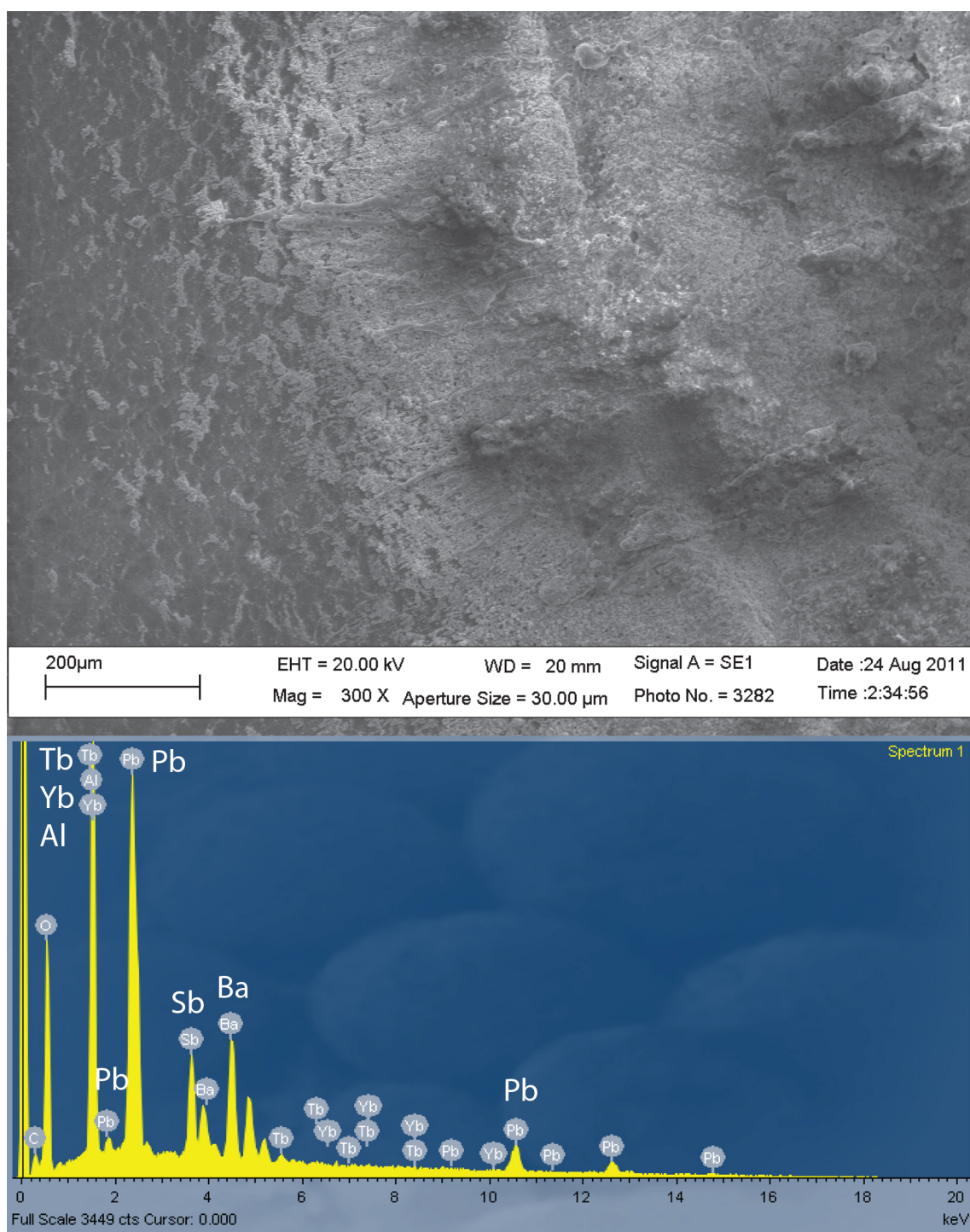


Figure S7 – SEM image (x300) of *UCMarker-1* and EDS spectrum of its GSR particles acquired directly on aluminum plate.

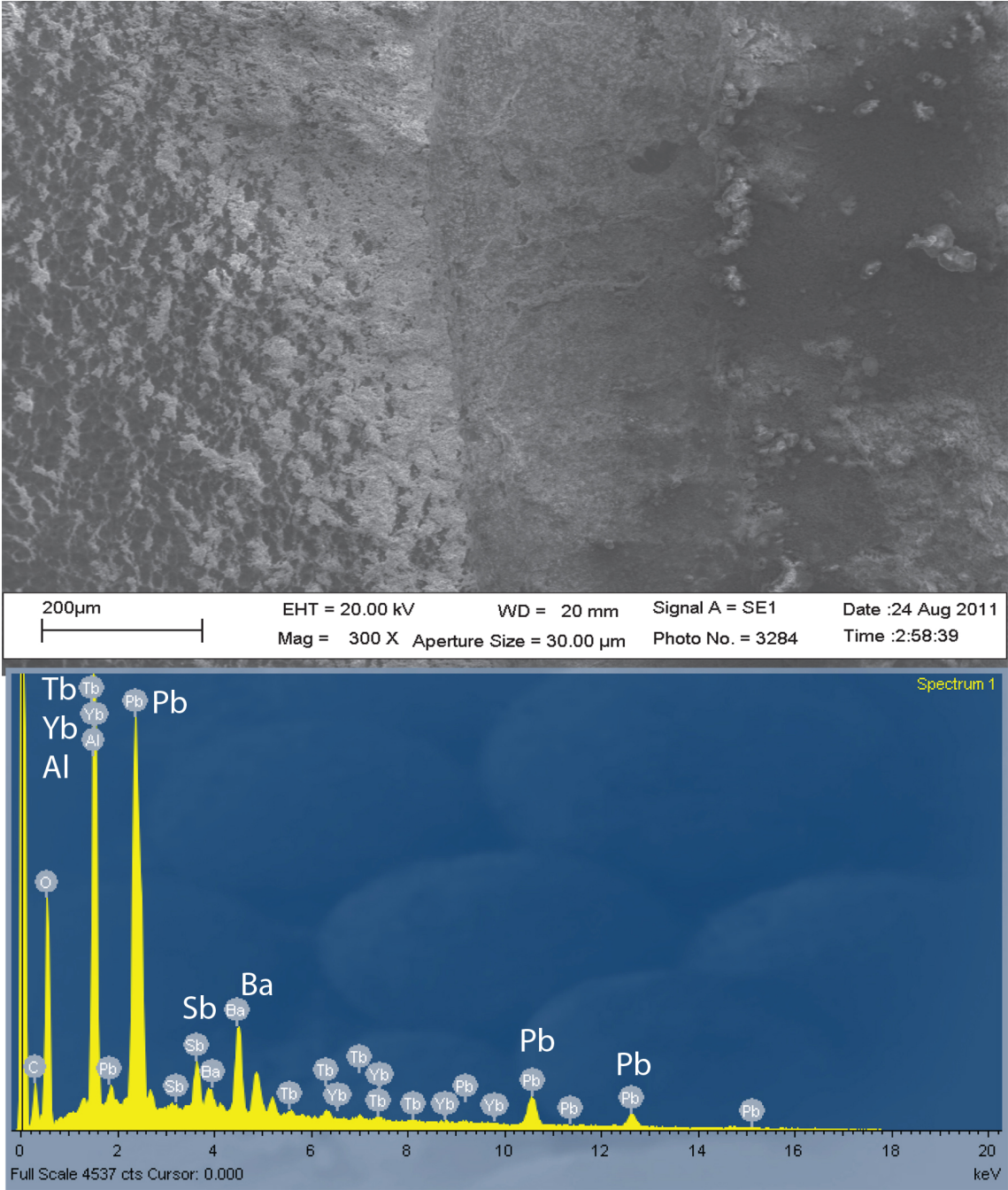


Figure S8 – SEM image (x300) of *UCMarker-2* and EDS spectrum of its GSR particles acquired directly on aluminum plate.

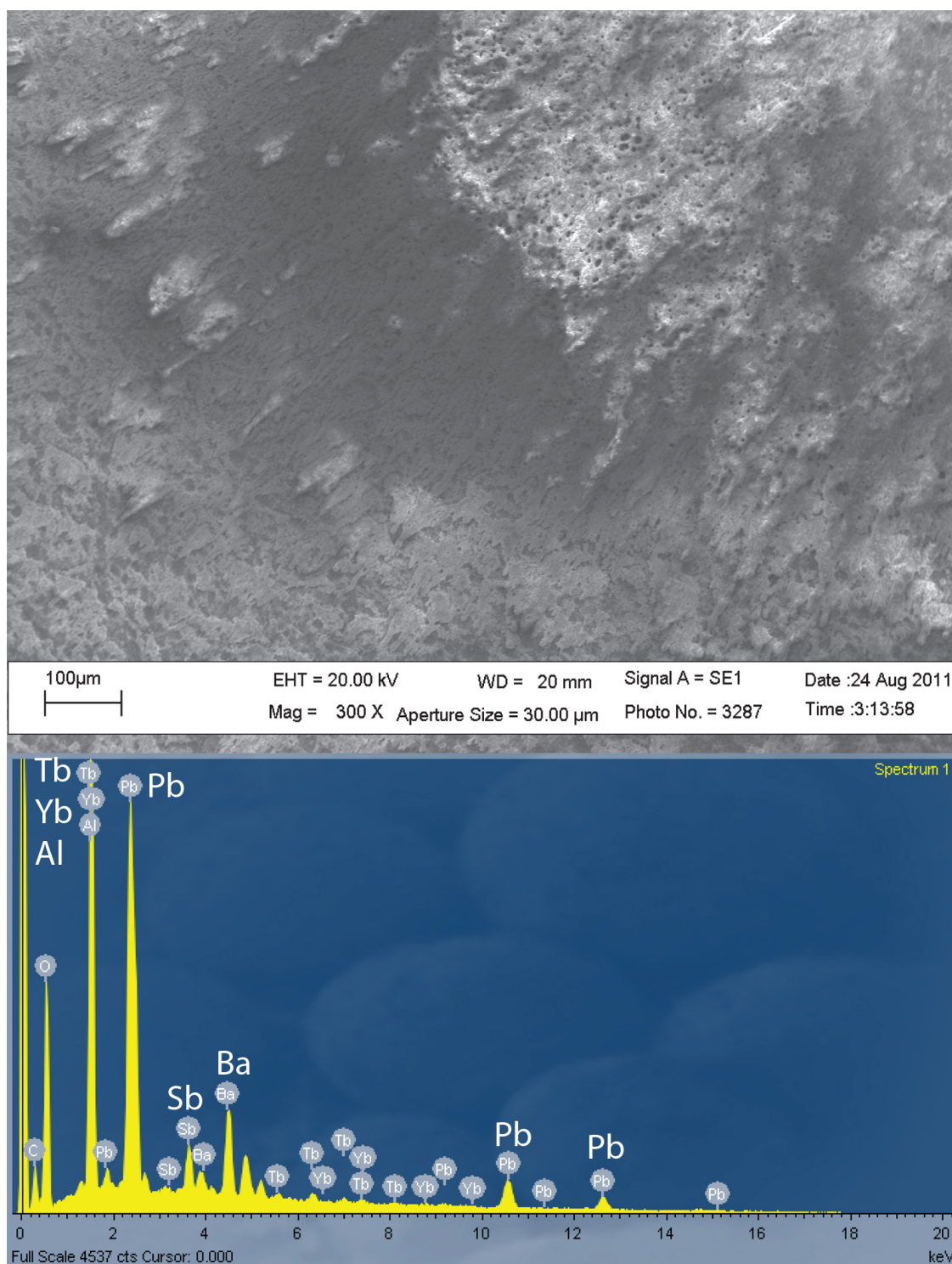


Figure S9 – SEM image (x300) of *UCMarker-3* and EDS spectrum of its GSR particles acquired directly on aluminum plate.

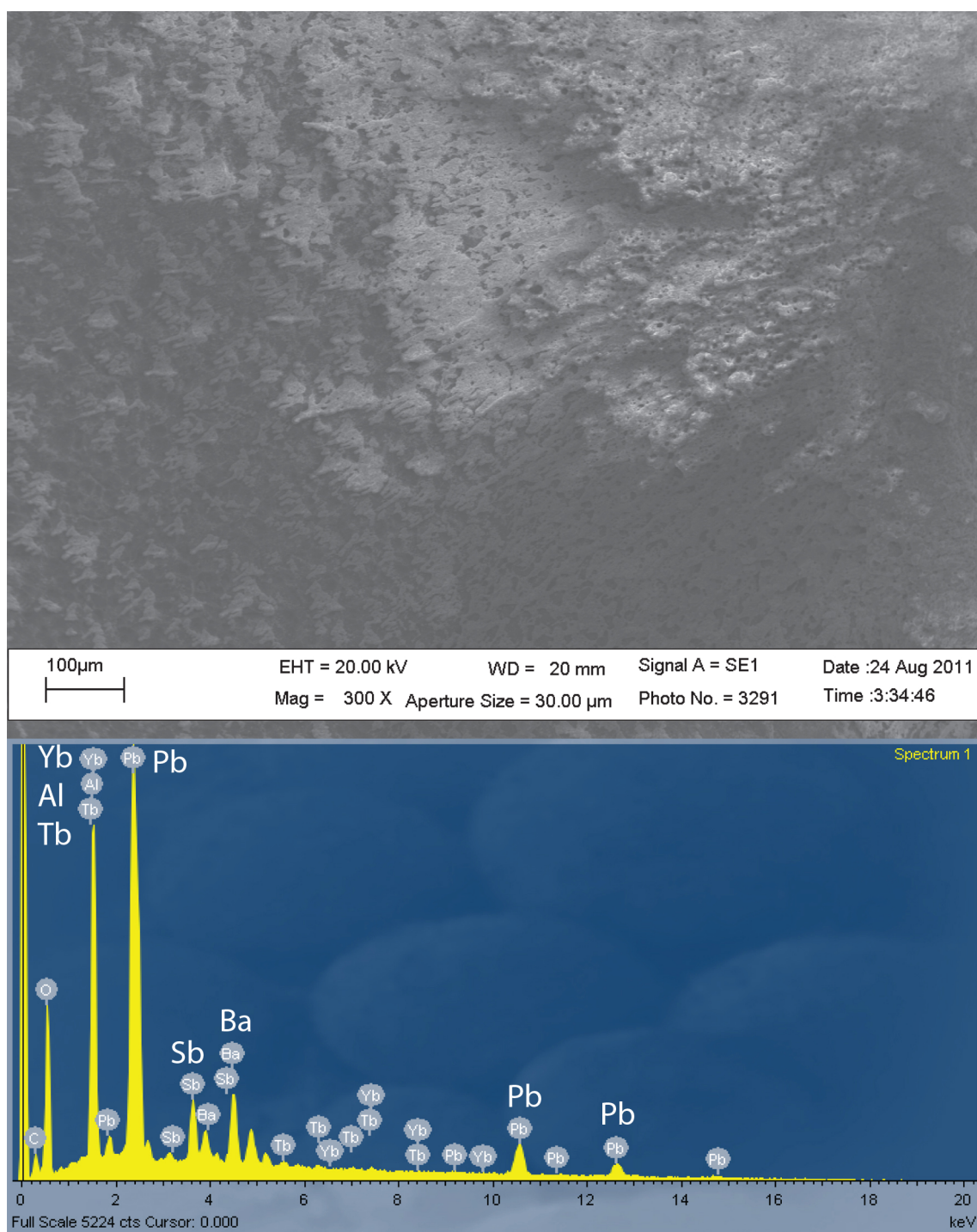


Figure S10 – SEM image (x300) of *UCMarker-5* and EDS spectrum of its GSR particles acquired directly on aluminum plate.

References

- [1] G. Nolze, W. Kraus, Powder Diffr. 1998, 13, 256.