

# Provenance, modification and use of manganese-rich rocks at Le Moustier, Dordogne, France

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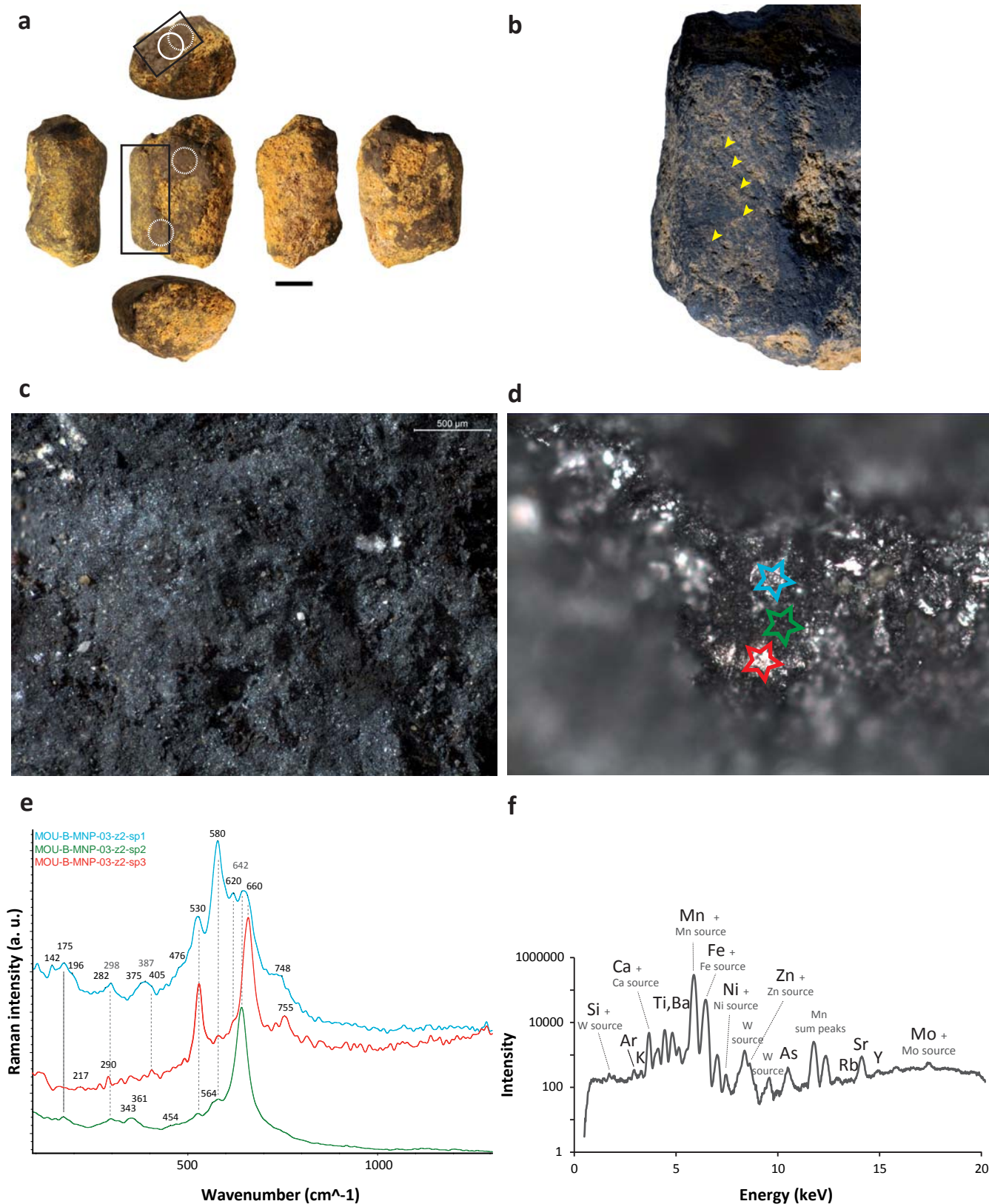
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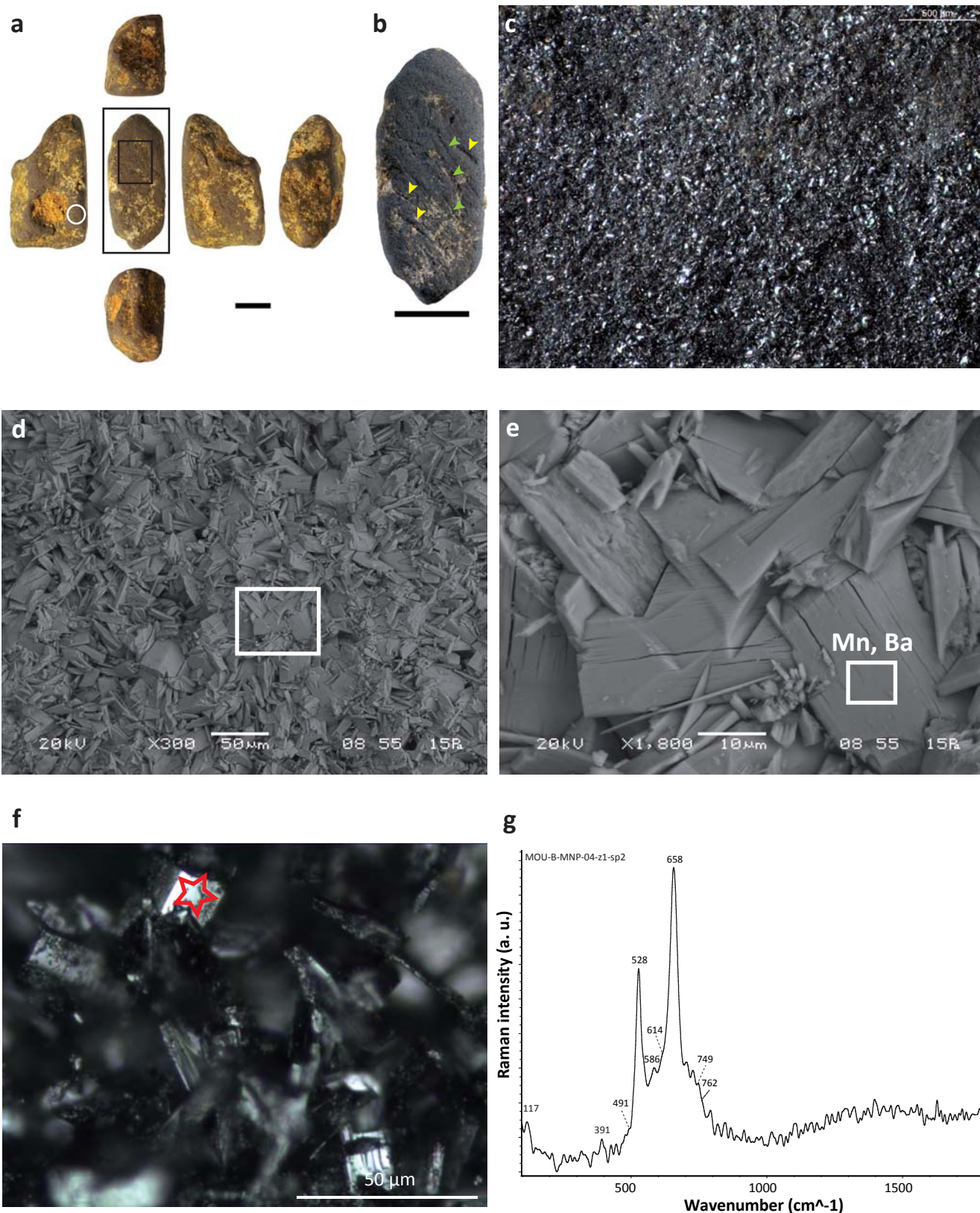
## S2 Figures

### Results of analyses conducted on Mn-rich archaeological pieces from Le Moustier

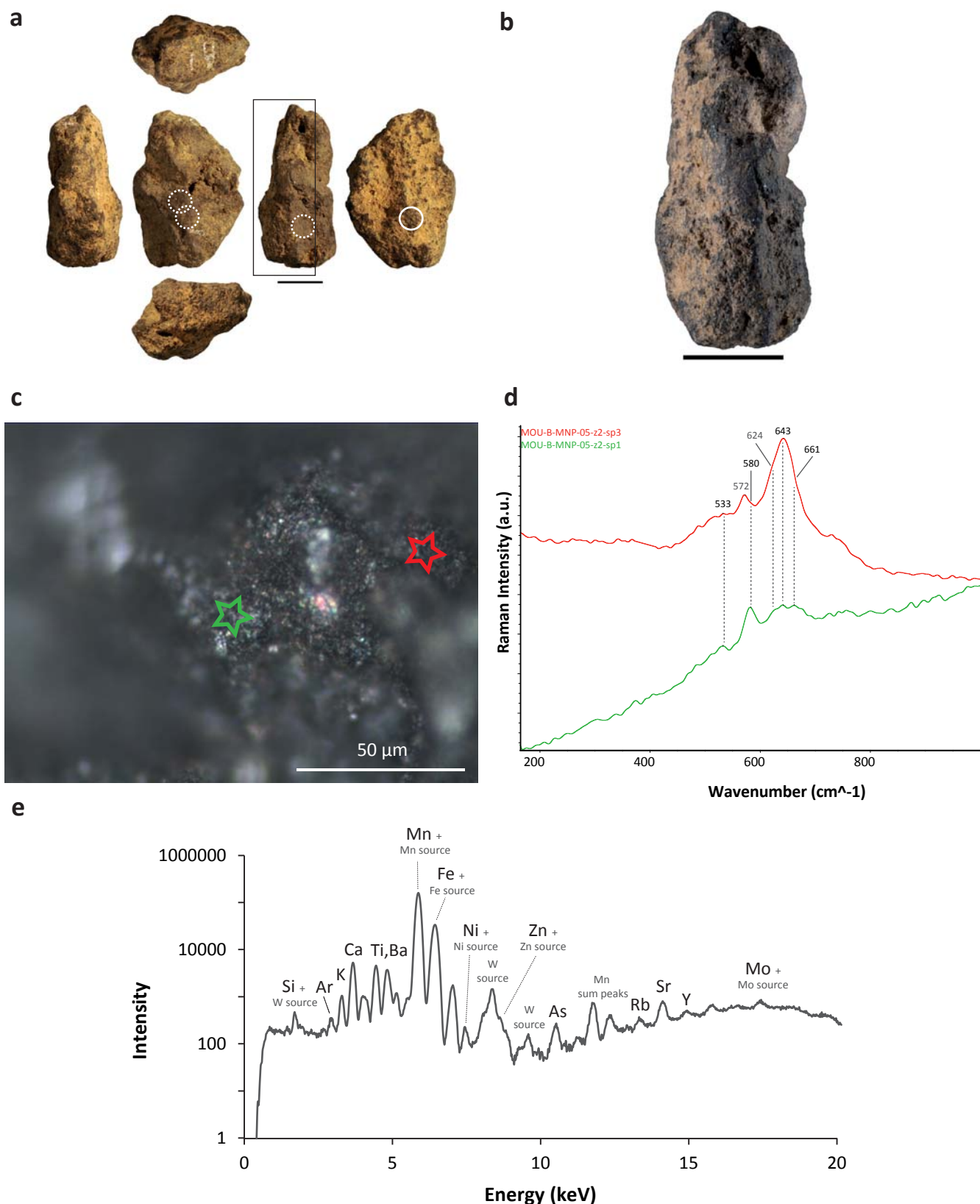
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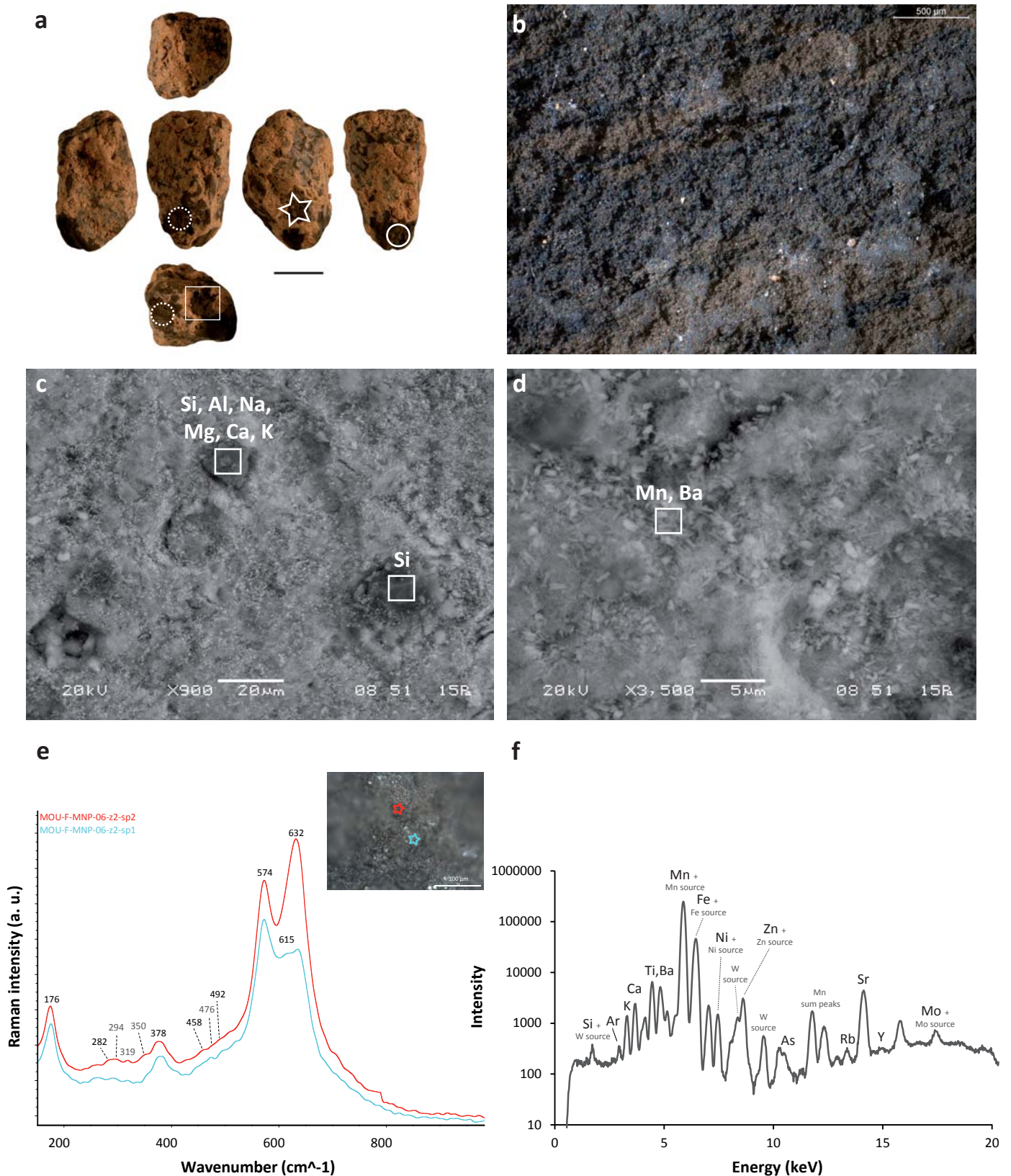
**Figure A. Results of analyses conducted on MOU-MNP-03.** a: photo of the lump. Squares indicate the position of macro photos (b, c). Circles indicate the location of  $\mu$ -RS (straight line) and EDXRF (dotted line) analyses; b: macro photo of one of the facets. Yellow arrows indicate traces of modification; c: macro photo of the raw surface of the sample; d: micro photo of the 3 analysed spots; e: Raman spectra of the 3 analysed spots; f: EDXRF spectrum obtained from sample.



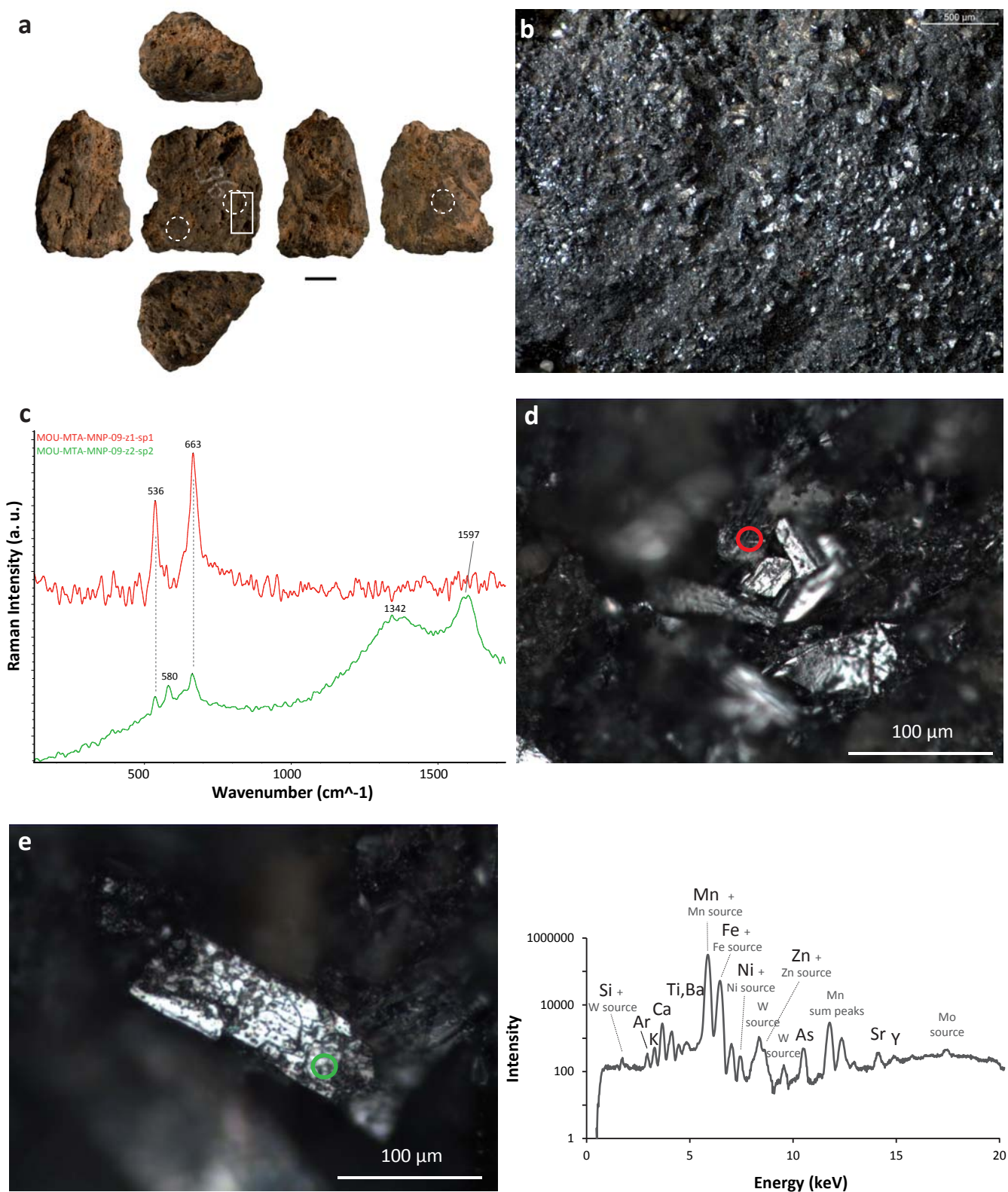
**Figure B. Results of analyses conducted on MOU-MNP-04.** a: photo of the lump. Squares indicate the position of macro photos (b, c). Circle indicates the location of SEM-EDS and  $\mu$ -RS analyses; b: macro photo of one of the facets displaying traces of modification; c: macro photo of the raw surface of the sample; d, e: SEM images in SE mode with results of EDS analyses; f: micro photo of the surface of the sample. Star indicates the analysed spot by  $\mu$ -RS; g: Raman spectrum showing the main bands of pyrolusite.



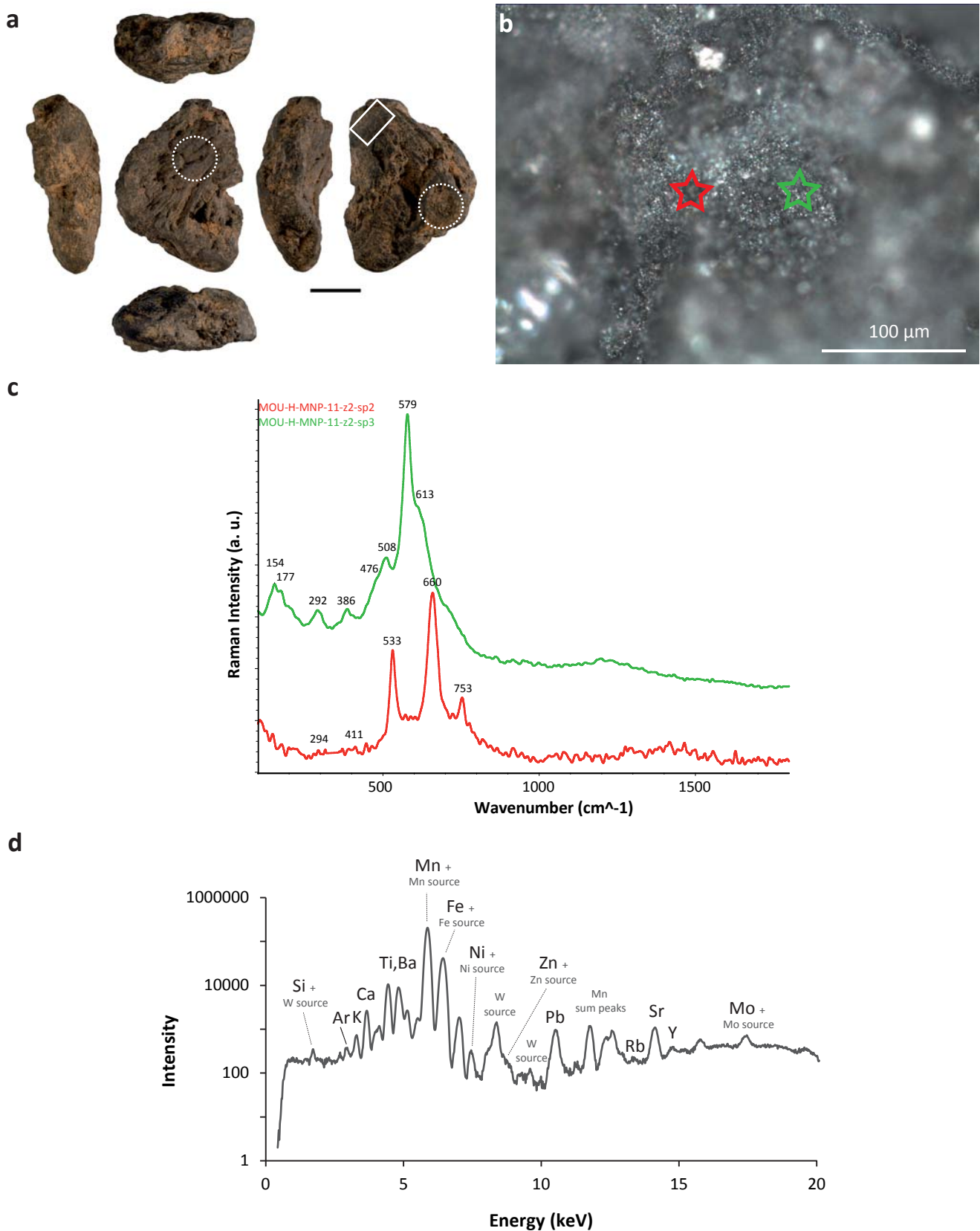
**Figure C. Results of analyses conducted on MOU-MNP-05.** a: photo of the lump. Square indicates the position of detailed photo of one of the facets (b). Circles indicate the location of the  $\mu$ -RS (straight line) and EDXRF (dotted line) analyses; b: macro photo of one of the facets of the sample; c: micro photo of the studied area. Stars indicate the analysed spots by  $\mu$ -RS; d: Raman spectra of the 2 spots showing the main bands of pyrolusite, pyrochroite, and hollandite; e: EDXRF spectrum obtained from sample.



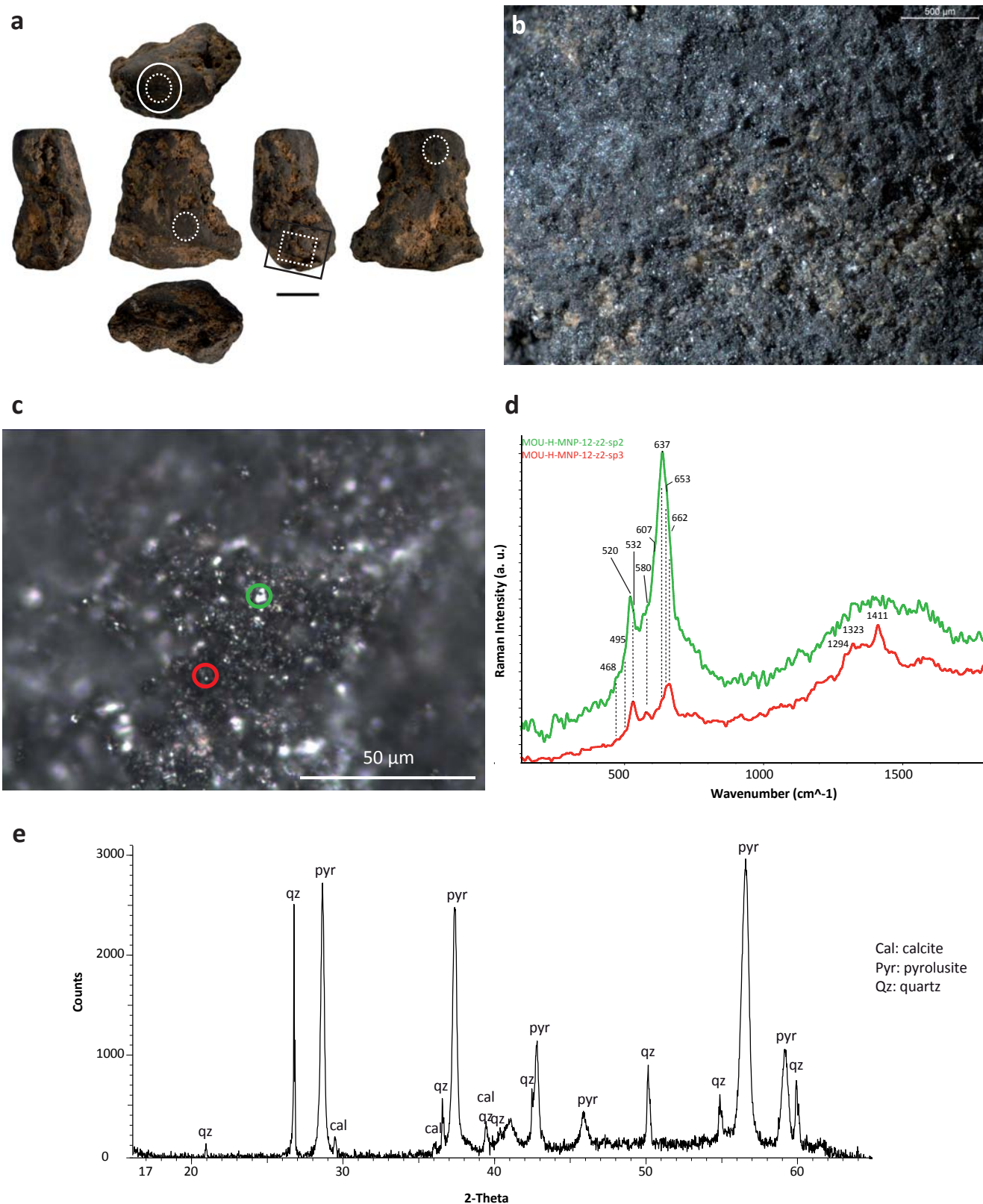
**Figure D. Results of analyses conducted on MOU-MNP-06.** a: photo of the lump. Square and star indicate the position of macro photo (b) and of SEM-EDS analyses (c, d). Circles indicate the location of the  $\mu$ -RS (straight line) and the EDXRF (dotted line) analyses; b: macro photo of the raw surface of the sample; c, d: SEM images in SE mode with results of EDS analyses; e: Raman spectra and micro photo of the analysed spots; f: EDXRF spectrum obtained from sample.



**Figure E. Results of analyses conducted on MOU-MTA-MNP-09.** a: photo of the sample. Square indicates the position of macro photo (b). Dotted circles indicate the analysed areas by EDXRF (e); b, c: micro photos of the surface of the sample. Circles indicate the analysed spots by  $\mu$ -RS; d: Raman spectra of the 2 points showing the main bands of pyrolusite (red spectrum) and pyrolusite, hollan-dite, and carbon (green spectrum); e: EDXRF spectrum obtained from sample.

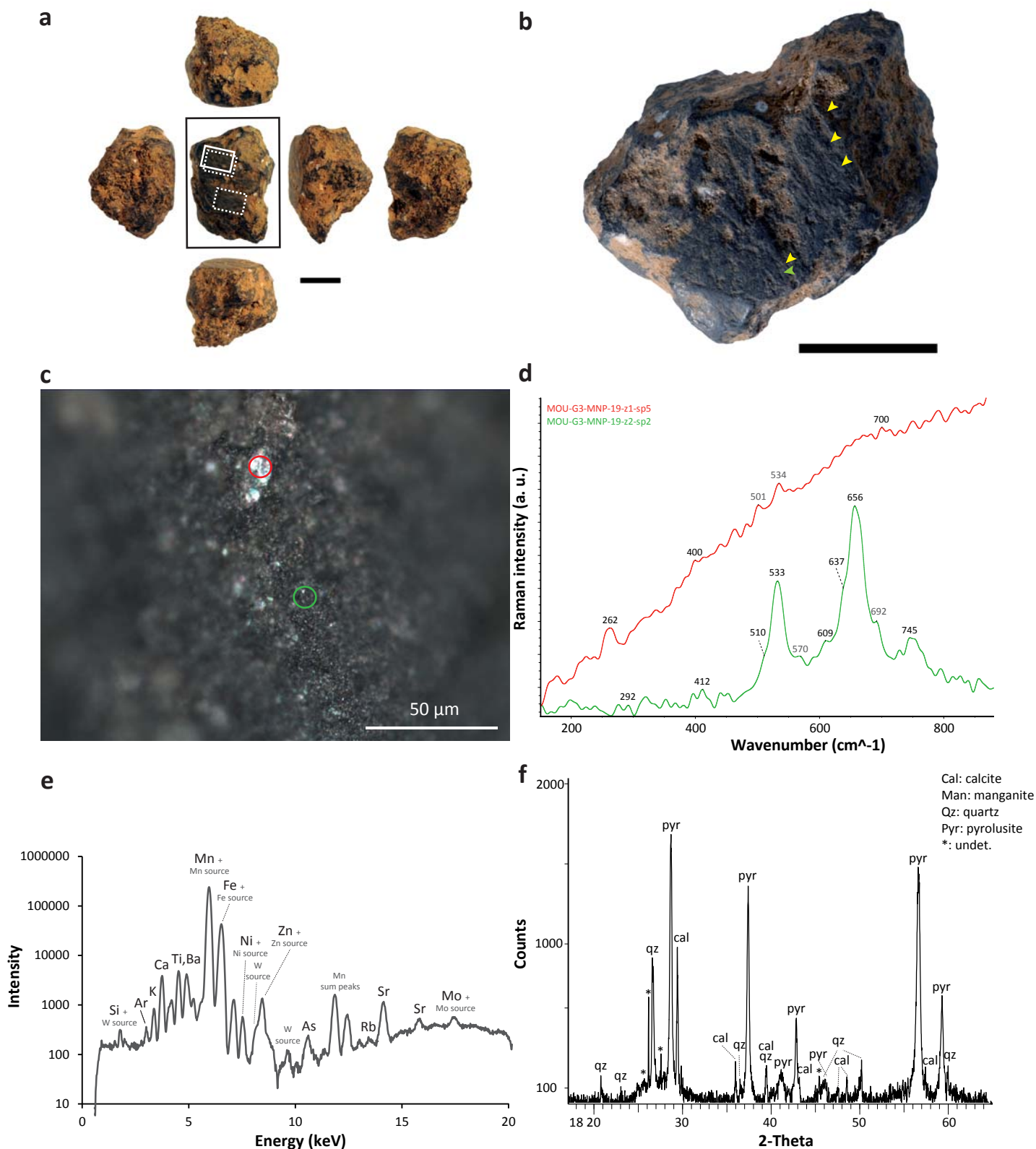


**Figure F. Results of analyses conducted on MOU-H-MNP-11.** a: photo of the lump. Square indicates the position of micro photo (b). Dotted-line circles indicate the location of EDXRF analyses (d); b: micro photo of the surface of the sample. Stars indicate the analysed spots by  $\mu$ -RS; c: Raman spectra of the 2 spots showing the heterogeneity of the sample; d: EDXRF spectrum obtained from sample.

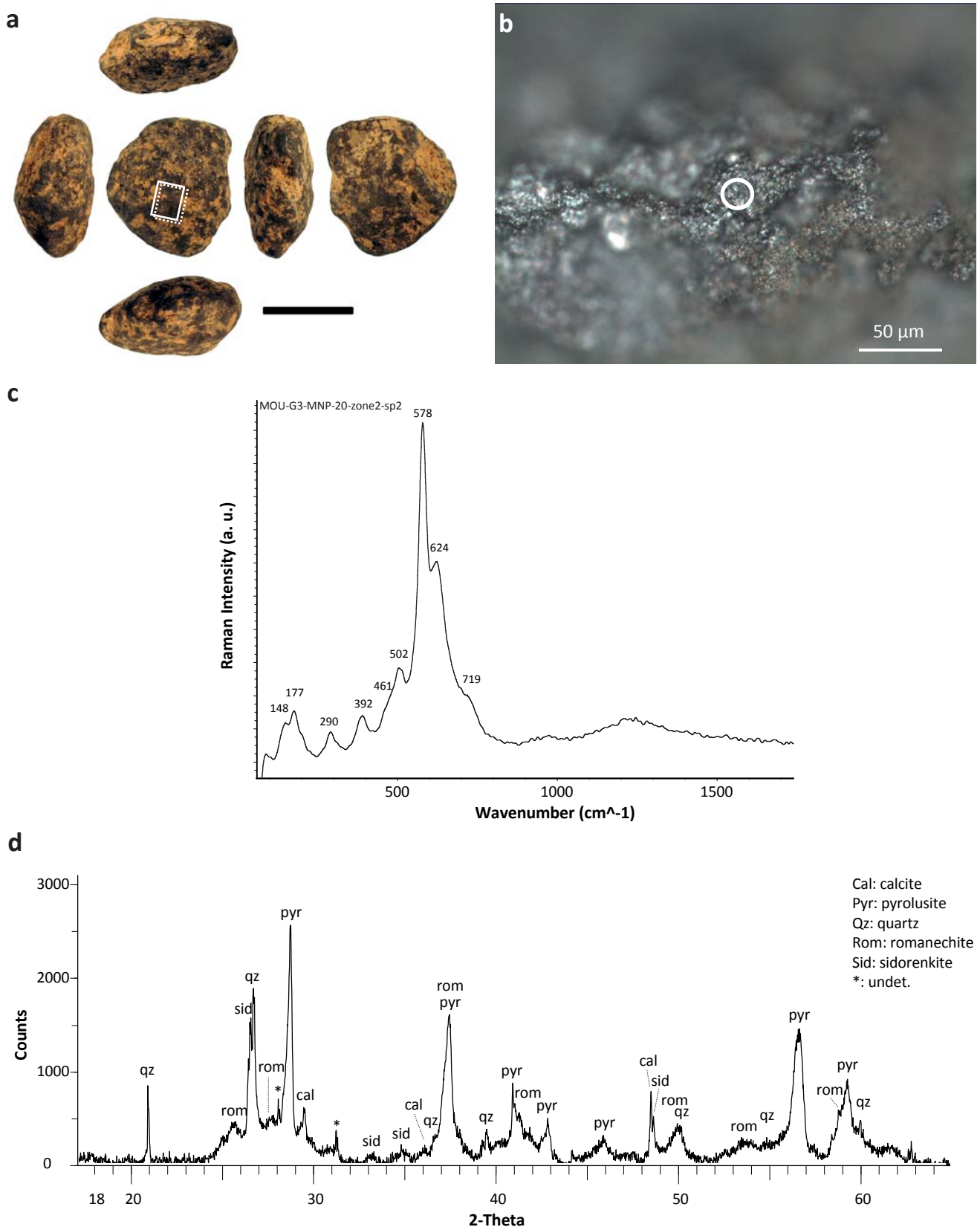


**Figure G. Results of analyses conducted on MOU-H-MNP-12.** a: photo of the lump. Squares indicate the position of macro photo (in black, b) and of  $\mu$ -RS analyses (in white, c, d). Circles show the location of EDXRF (dotted line, not shown) and XRD (straight line, e) analyses; b: macro photo of the surface of the sample; c: micro photo of the studied surface by  $\mu$ -RS; d: Raman spectra of the 2 showing the main bands of todorokite, pyrolusite, hollandite, and the possible presence of aluminosilicates. Circles indicate the analysed spots by  $\mu$ -RS; e: XRD spectrum obtained from sample.

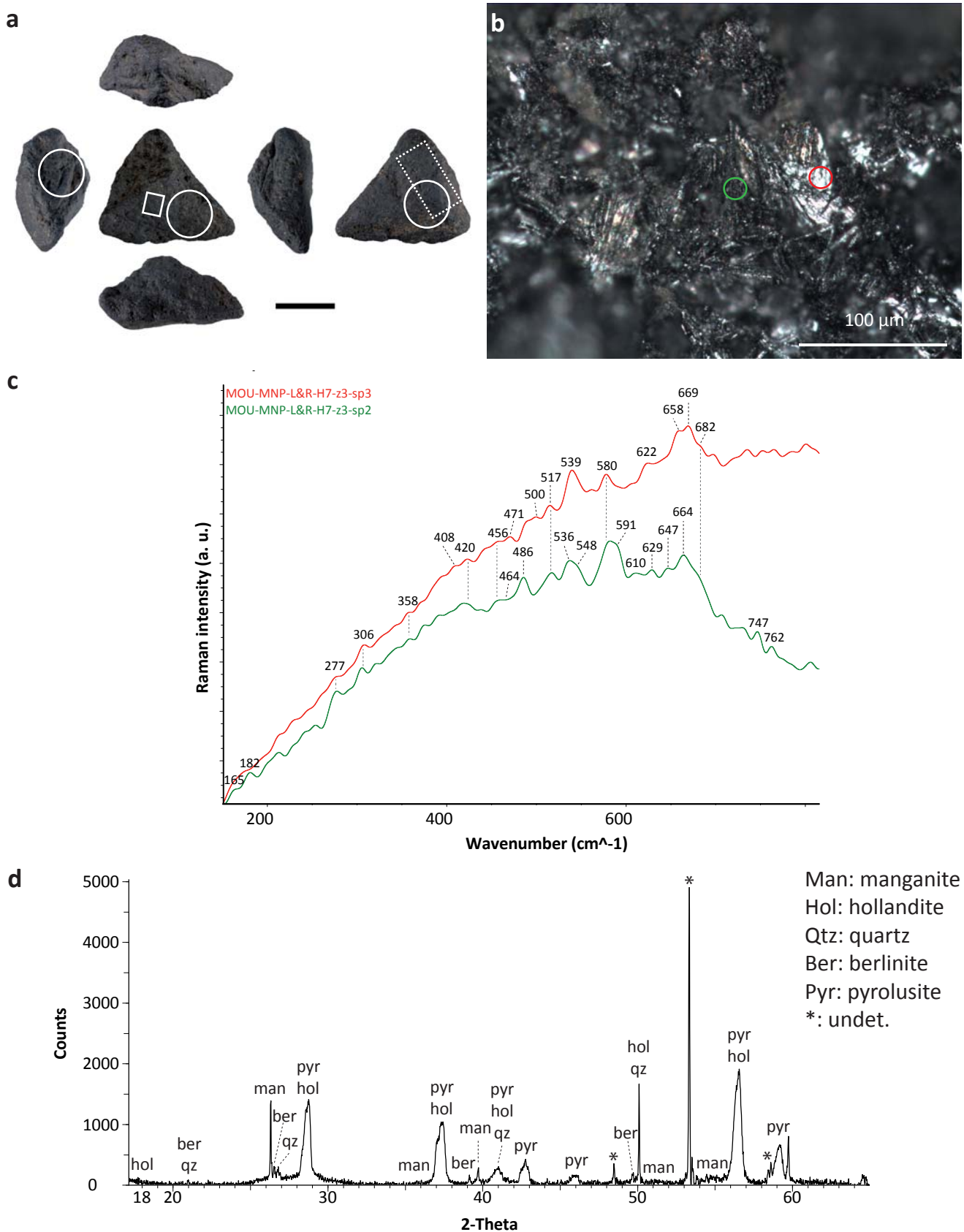




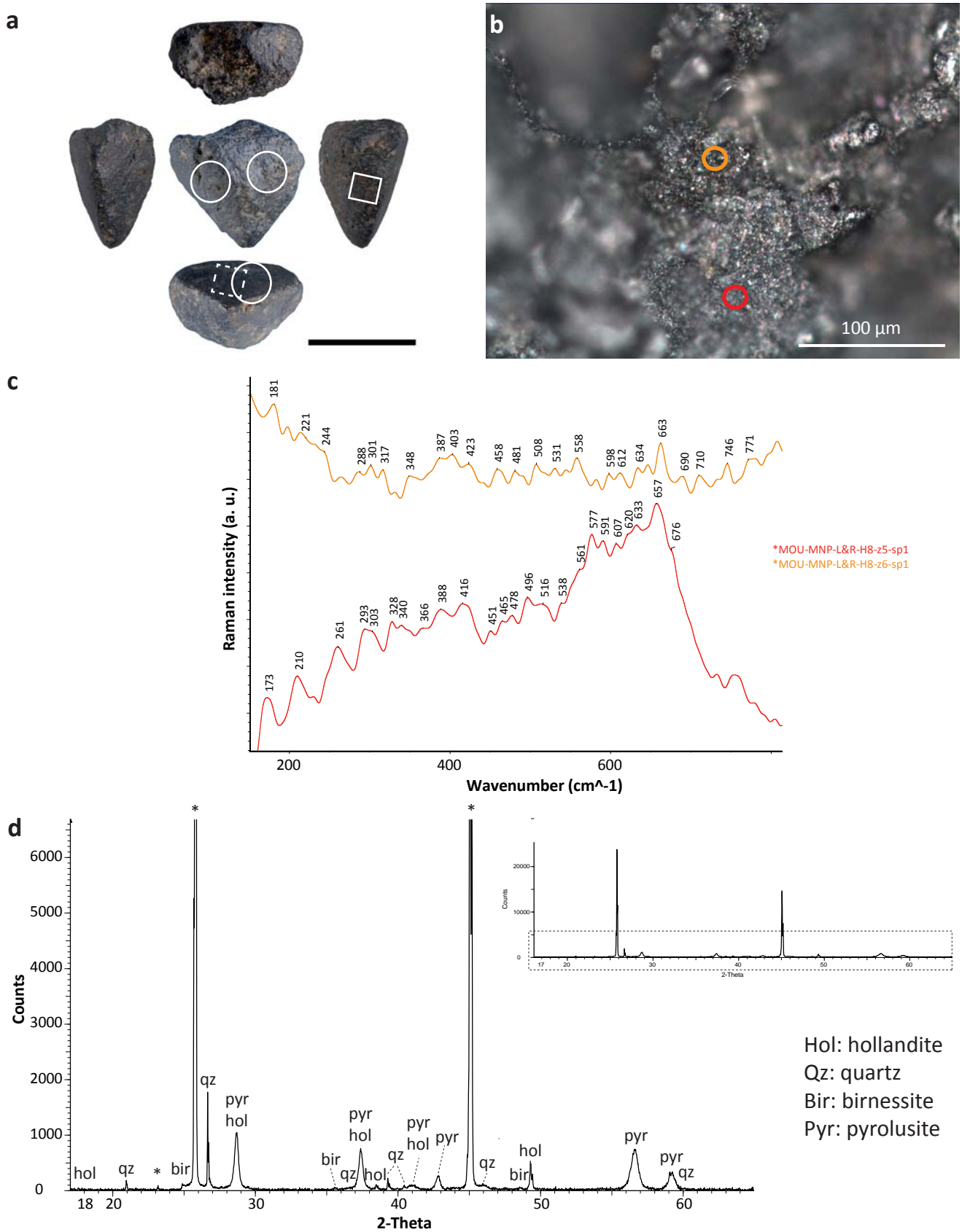
**Figure H. Results of analyses conducted on MOU-G3-MNP-19.** a: photo of the lump. Black square indicates the position of macro photo of the facet (b) while white squares indicate the location of analyses (dotted line -  $\mu$ -RS (c, e); straight line - XRD (d)); b: macro photo of the facet; c: micro photo of the surface of the sample. Cercles indicate the analysed spots by  $\mu$ -RS; d: Raman spectra of the 2 spots showing the main bands of muscovite (red spectrum) and pyrolusite (green spectrum), amongst other mineral phases; e, f: EDXRF and XRD spectra obtained from sample.



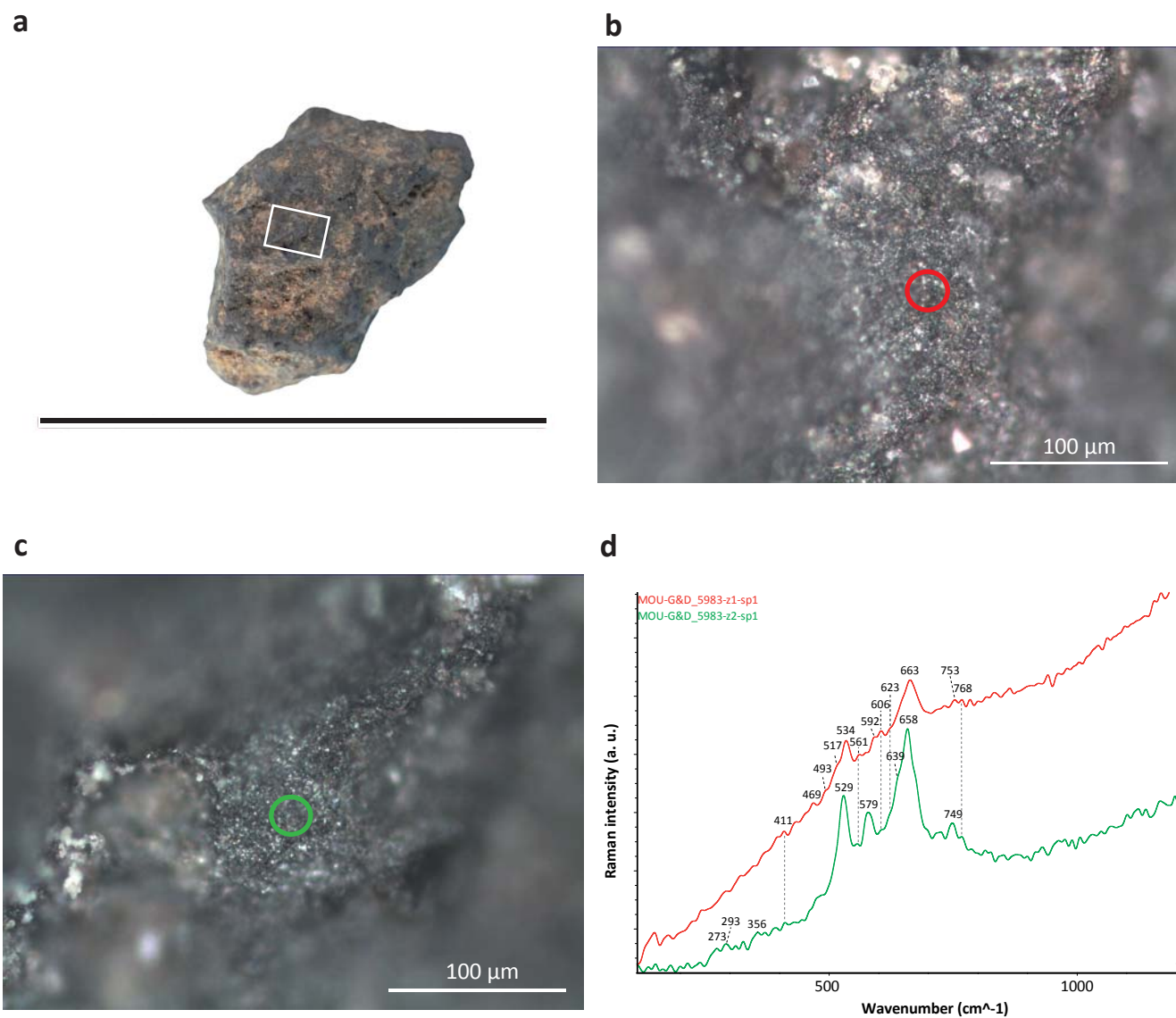
**Figure I. Results of analyses conducted on MOU-G3-MNP-20.** a: photo of the lump. Squares indicate the position of micro photo (dotted line) and Raman and XRD analyses (white straight line); b: micro photo of the surface of the sample. Circle indicates the analysed spot by  $\mu$ -RS; c: Raman spectrum of the spot showing the main bands of hollandite; d: XRD spectrum obtained from sample.



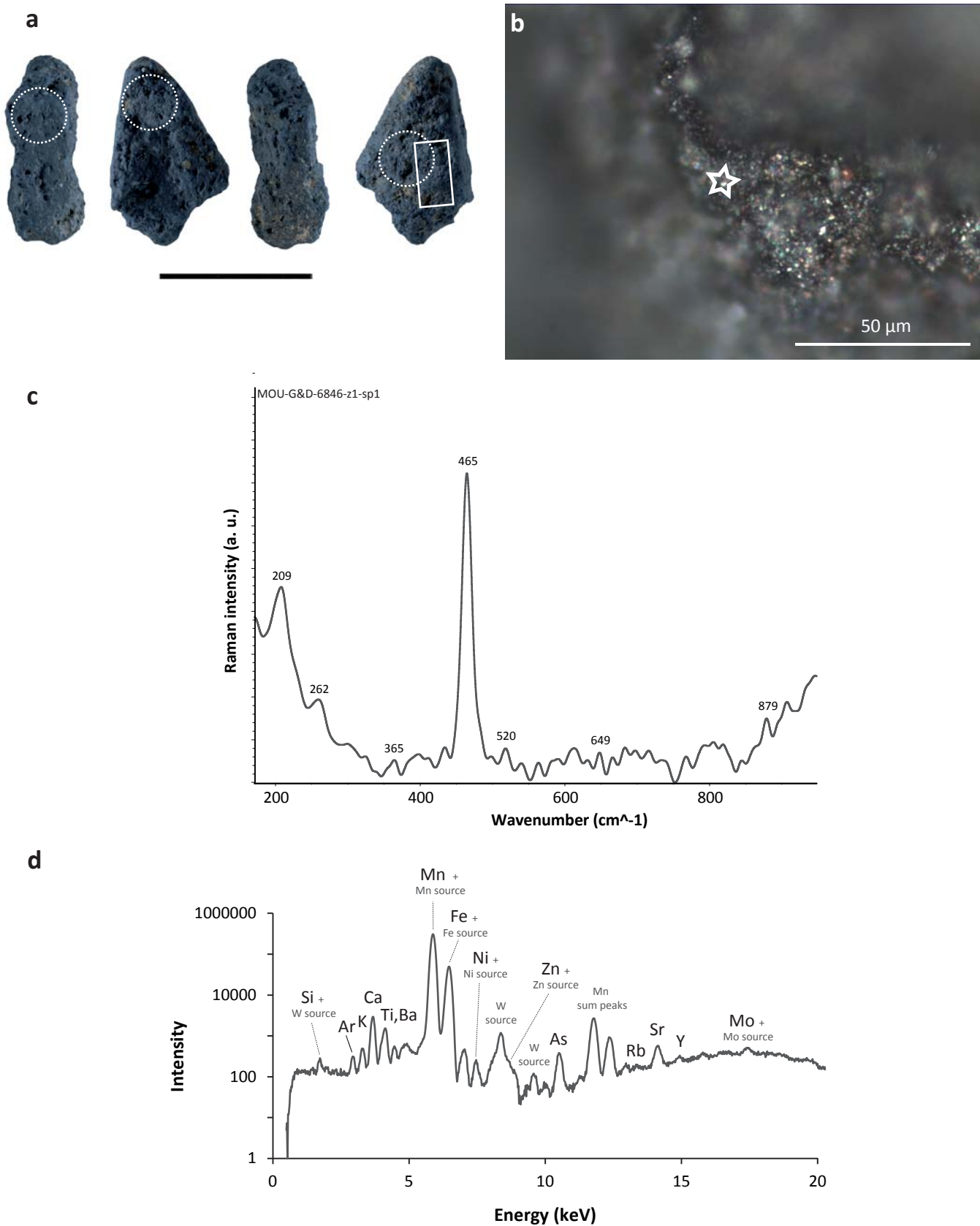
**Figure J. Results of analyses conducted on MOU-MNP-L&R-H7.** a: photo of the sample. Squares indicate the position of  $\mu$ -RS and XRD analyses - straight and dotted line - while circles indicate EDXRF measurements (not shown); b: micro photo of the surface of the sample. Circles indicate the analysed spots; c: Raman spectra of the 2 spots by  $\mu$ -RS; d: X-ray diffractogram obtained from sample.



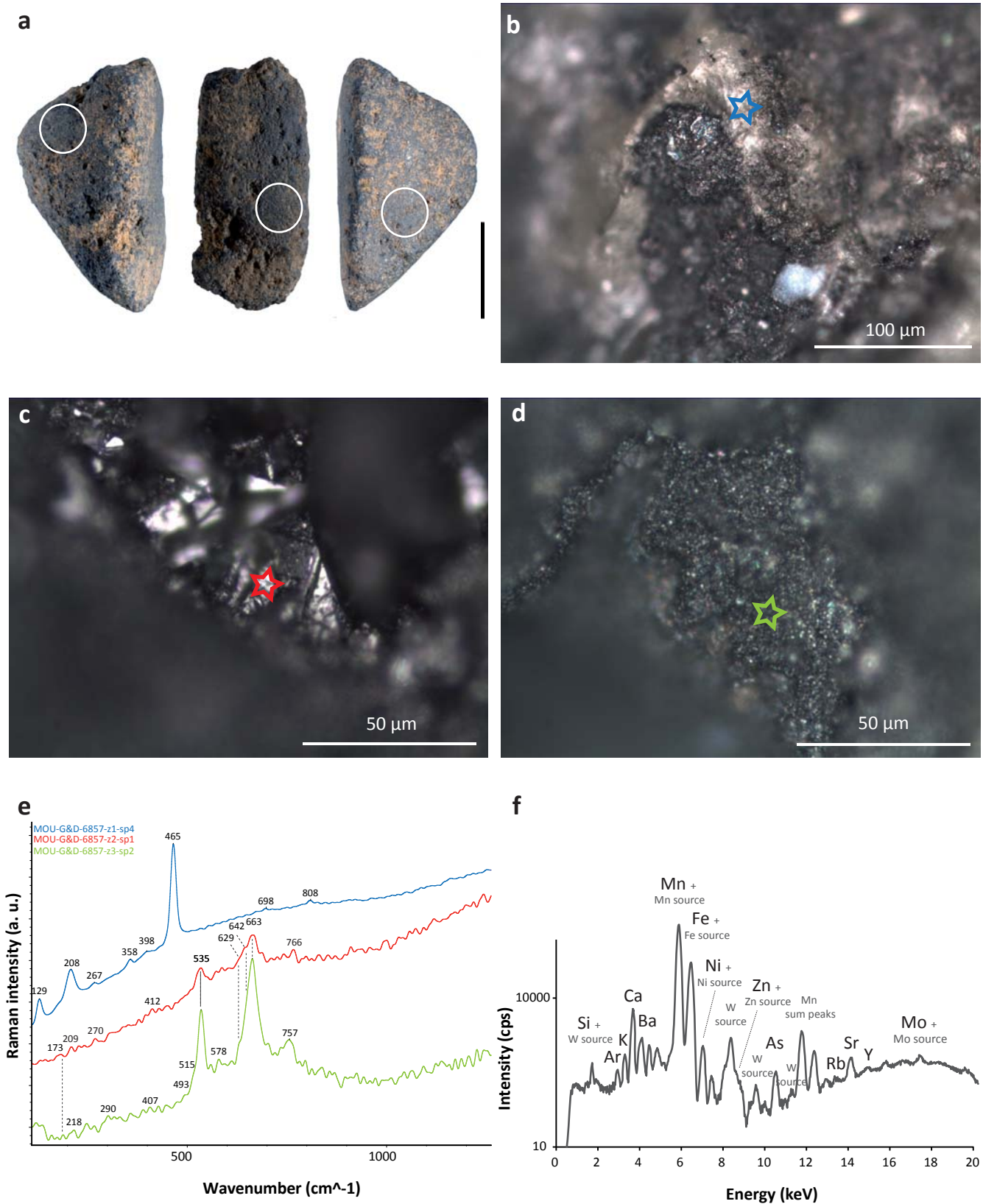
**Figure K. Results of analyses conducted on MOU-MNP-L&R-H8.** a: photo of the lump. Squares indicate the position of  $\mu$ -RS and XRD analyses - straight and dotted line - while circles indicate EDXRF measurements (not shown); b: micro photo of the surface of the sample. Circles indicate the analysed spots by  $\mu$ -RS; c: Raman spectra of the 2 spots; d: X-ray diffractogram obtained from



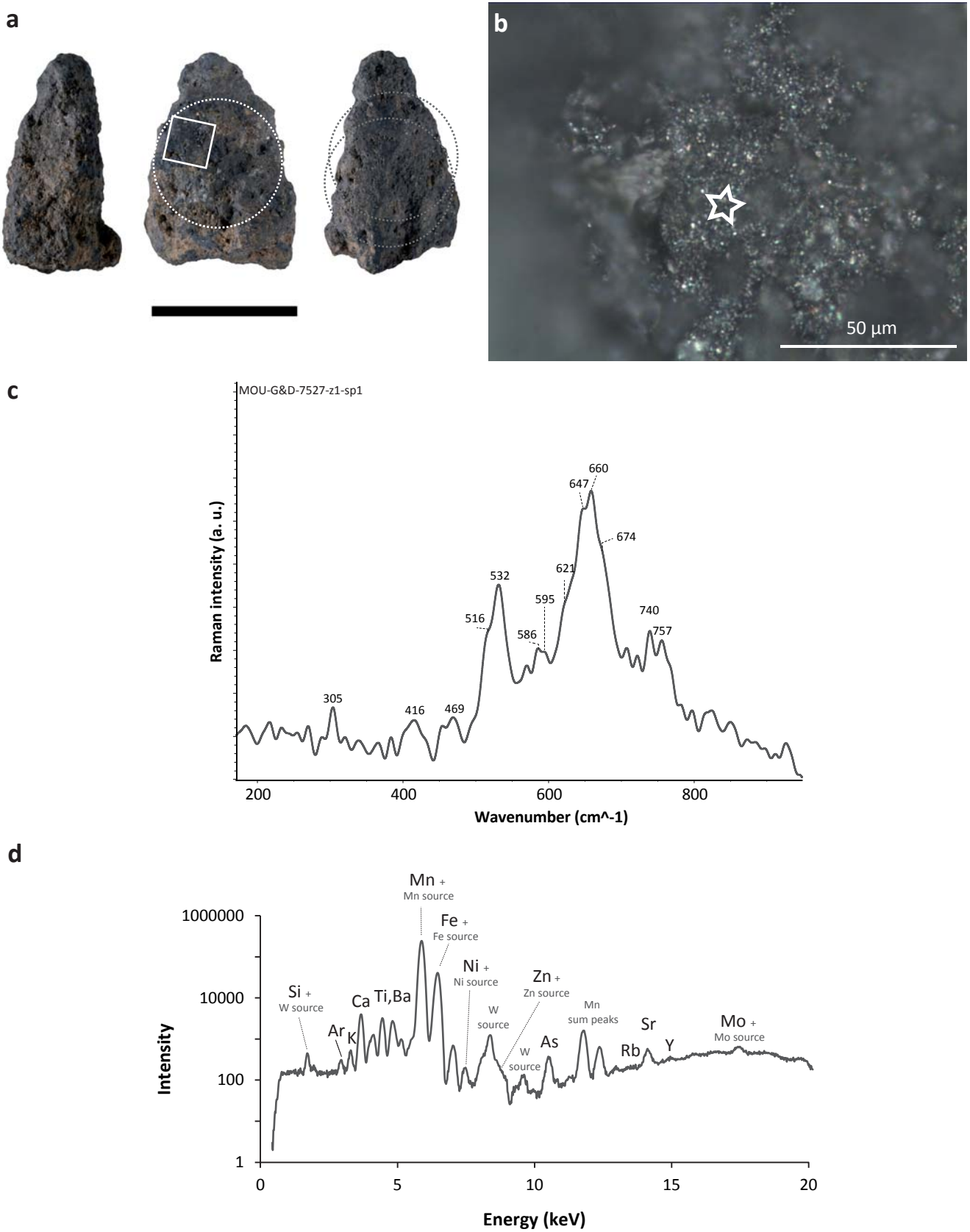
**Figure L. Results of analyses conducted on MOU-G&D-5983.** a: photo of the fragment. Square indicates the position of micro photos (b, c); b, c: micro photos of the raw surfaces of the sample. Circles indicate the analysed spots by  $\mu$ -RS; d: Raman spectra of the 2 spots.



**Figure M. Results of analyses conducted on MOU-G&D-6846.** a: photo of the fragment. Square indicates the position of micro photo (b). Cercles indicate the location of the EDXRF analyses; b: micro photo of the surface of the sample. Star indicates the analysed spot; c: Raman spectrum of the spot; d: EDXRF spectrum obtained from sample.

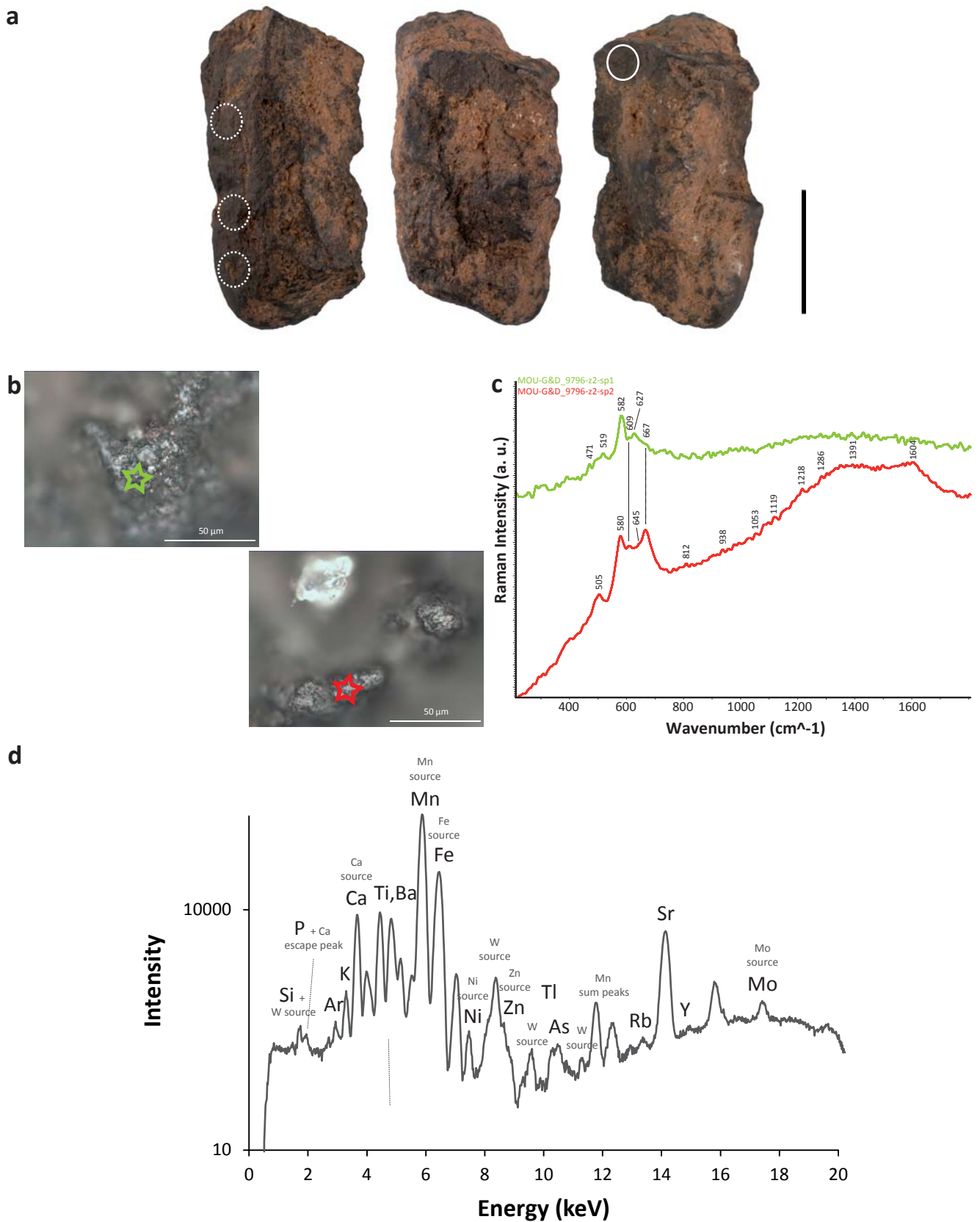


**Figure N. Results of analyses conducted on MOU-G&D-6857.** a: photo of photo of the lump. Circles indicate the position of the EDXRF analyses; b, c, d: micro photos of the surface of the sample. Stars indicate the analysed spots by  $\mu$ -RS; e: Raman spectra of the 3 spots showing the presence of pyrolu-site, pyrochroite, and quartz; f: EDXRF spectrum obtained from sample.

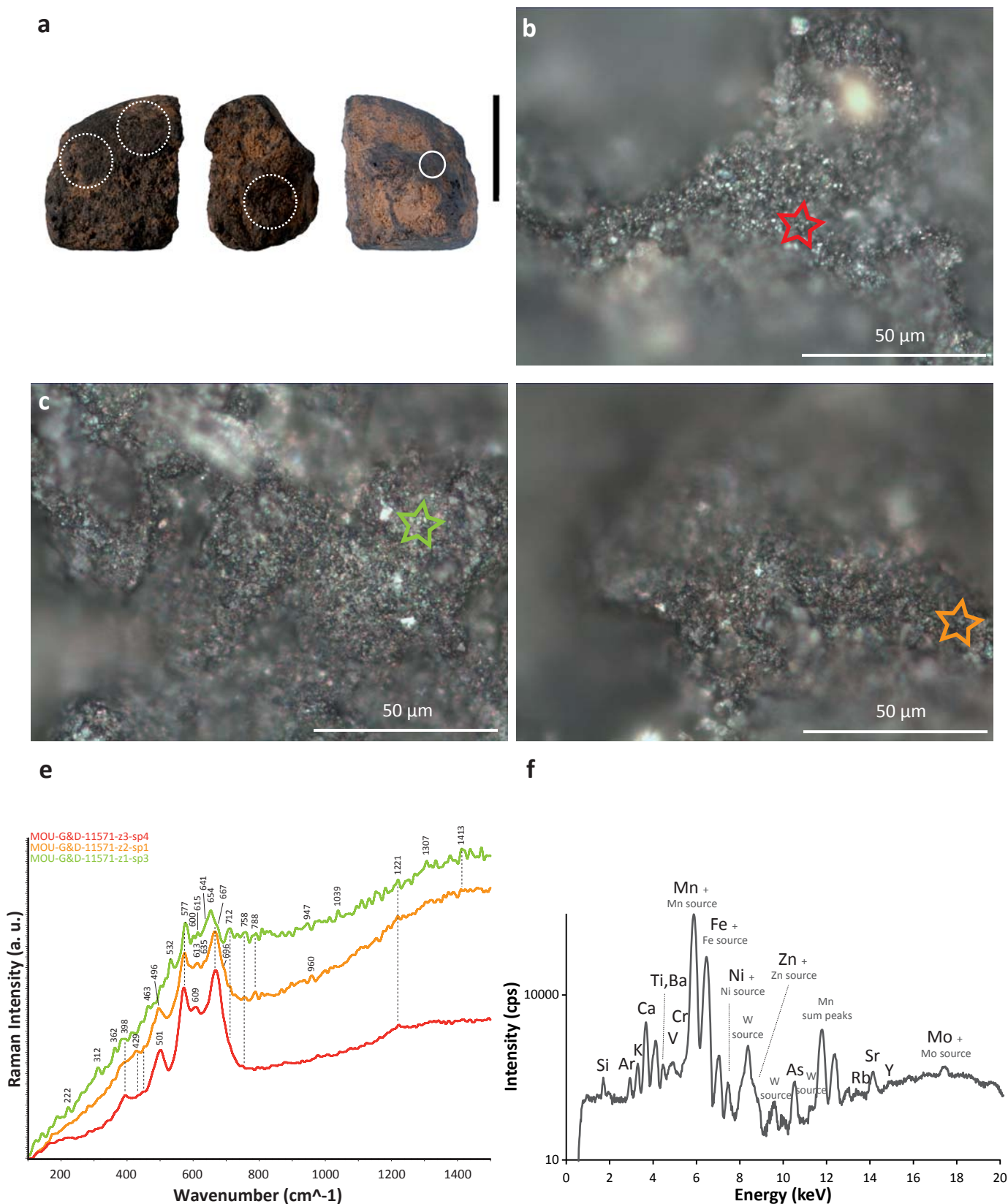


**Figure O. Results of analyses conducted on MOU-G&D-7527.** a: photo of the fragment. Square indicates the position of the micro photo (b). Circles indicate the location of EDXRF analyses (d); b: micro photo of the surface of the sample. Star indicates the analysed spot by  $\mu$ -RS; c: Raman spectrum of the spot showing the main bands of pyrolusite, pyrochroite, and hollandite; d: EDXRF spectrum obtained from sample.





**Figure P. Results of analyses conducted on MOU-G&D-9796.** a: photo of the object. Cercles indicate the location of  $\mu$ -RS (straight line) and EDXRF (dotted line) analyses; b, c: microscopic images and Raman spectra of the spots showing the main bands of hollandite, pyrochroite, pyrolusite, and todorokite amongst other mineral phases; d: EDXRF spectrum obtained from sample.



**Figure Q. Results of analyses conducted on MOU-G&D-11571.** a: photo of the lump. Circles indicate the location of  $\mu$ -RS (straight line) and EDXRF (dotted line) analyses; b, c, d: micro photos of the surface of the sample. Stars indicate the analysed spots by  $\mu$ -RS; e: Raman spectra of the three spots showing the main bands of hollandite and pyrolusite, amongst others; f: EDXRF spectrum obtained from sample.