

Supporting information for the manuscript submitted to *American Mineralogist* entitled,

“Evidence for nanocrystals of vorlanite, a rare uranate mineral, in the Nopal I low-temperature uranium deposit (Sierra Peña Blanca, Mexico)”

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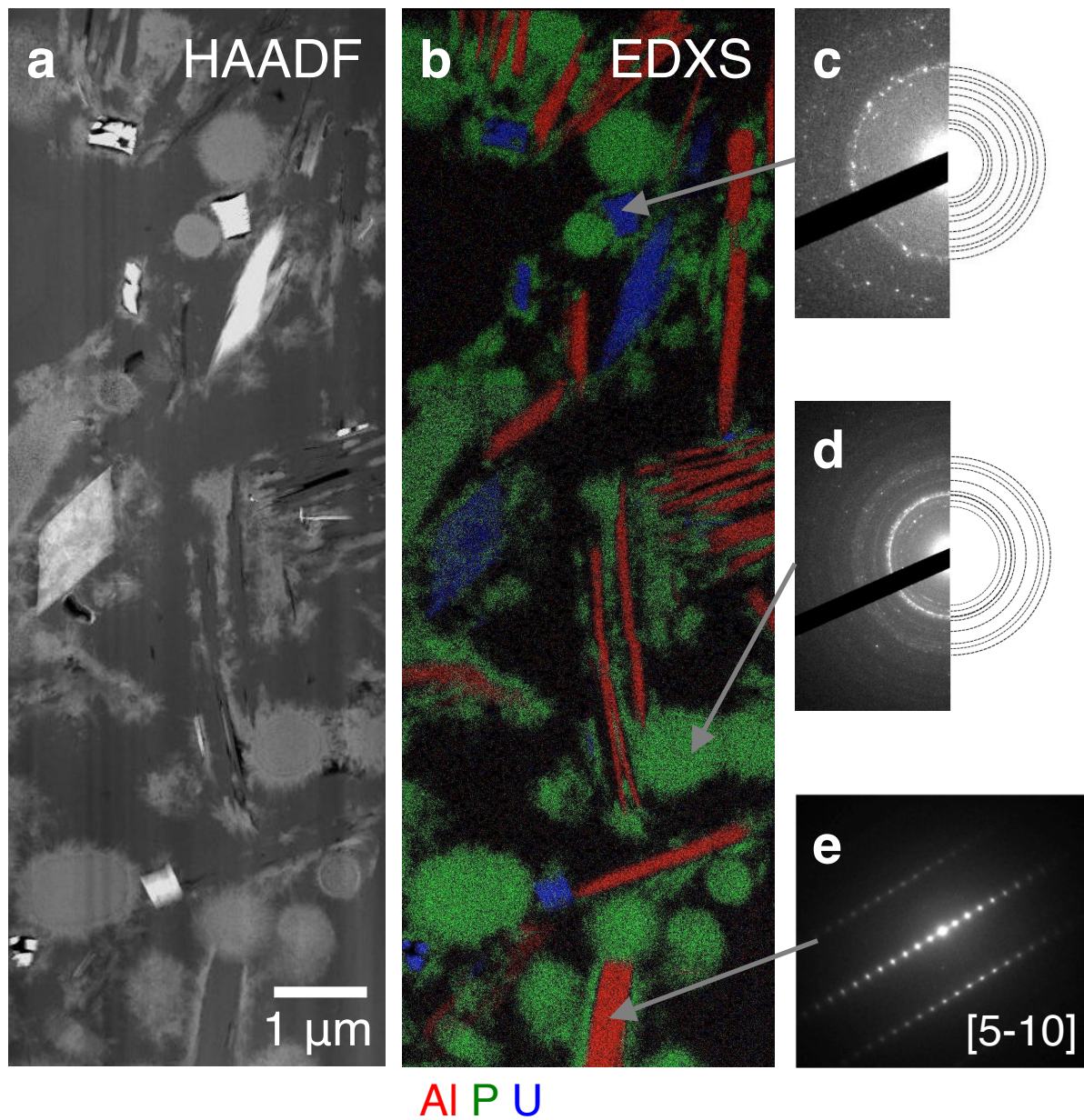


Figure S1. (a) STEM picture in HAADF mode of the thin cross-section in the uranyl silicate-calcium phosphate-aluminosilicate zone and (b) corresponding EDXS map (U in blue, P in green and Al in red). Selected area electron diffraction (SAED) patterns of (c) β -uranophane, (d) apatite and (e) kaolinite.

Table S1. Chemical composition of minerals and of the opal Ca-U zone (average) measured by electron microprobe analysis.

| | Apatite | Uranophane | Ca-U zone (average) |
|----------|-------------------|----------------------|---------------------|
| O wt. % | 36.11 | 19.12 | 46.18 |
| F wt. % | 5.68 | 0.10 | 0.02 |
| Na wt. % | 0.11 | < d. l. ^a | < d. l. |
| Mg wt. % | 0.03 | < d. l. | 0.01 |
| Al wt. % | 0.02 | 0.06 | 0.03 |
| Si wt. % | 6.79 ^b | 7.62 | 40.23 |
| P wt. % | 11.82 | 0.68 | < d. l. |
| S wt. % | 0.17 | 0.01 | 0.01 |
| Cl wt. % | 0.02 | 0.05 | 0.01 |
| Ca wt. % | 31.22 | 4.98 | 0.24 |
| Ti wt. % | < d. l. | < d. l. | 0.01 |
| Mn wt. % | 0.01 | 0.01 | 0.01 |
| Fe wt. % | 0.04 | 0.04 | 0.01 |
| Pb wt. % | 0.04 | < d. l. | 0.04 |
| U wt. % | 2.67 | 55.68 | 1.41 |

^a : < d. l. = below the detection limit.

^b : Si content is due to opal surrounding apatite.

Details on the chemical composition and morphology of minerals occurring in the uranyl silicate-calcium phosphate-aluminosilicate zone.

F-rich/Cl-poor apatite crystals display an ill-defined morphology (Table S1 and Fig. S1). Beta-uranophane crystals show a well-shaped morphology (Fig. S1). Kaolinite layers are all oriented toward the same direction (Fig. S1), perpendicular to the focused ion beam milling direction and then parallel to the direction of the opal-filled fissures.

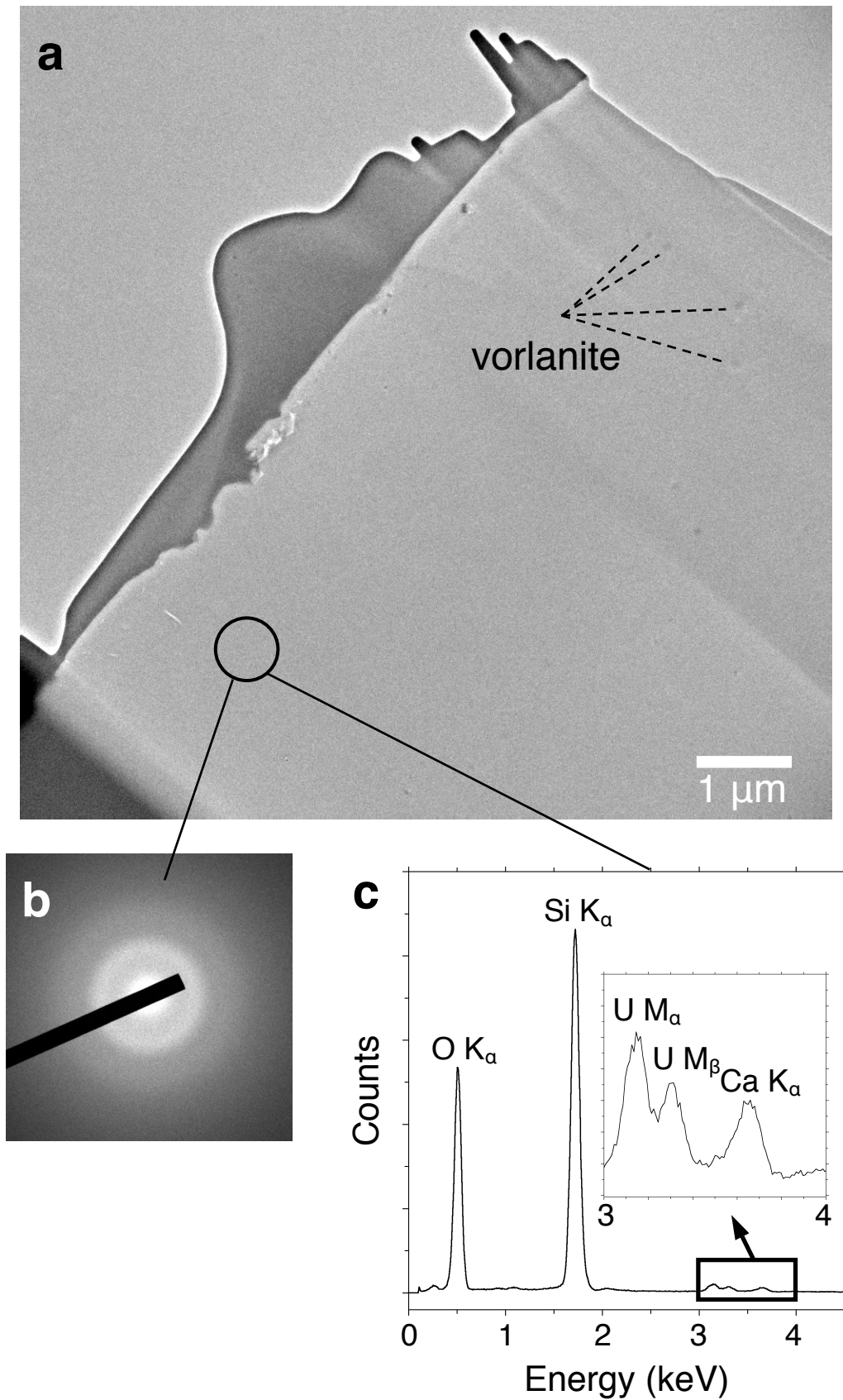


Figure S2. (a) TEM picture in the bright-field mode of the Ca-U zone thin cross-section. (b) Selected area electron diffraction (SAED) pattern and (c) EDXS spectrum in the predominating amorphous zone. The thin cross-section mainly consists of opal A with minor amounts of Ca and U.