

# **APPENDIX A**

## **TUC Resources Scanning Electron Microscopy Images**

## FIGURE 1: TUC Resources STDH-03 Sample

Backscattered electron (BSE) micrographs from the STDH-03 sample:

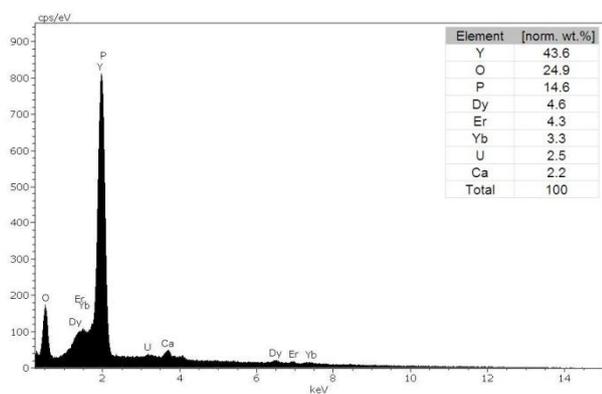
Use the zoom function on the electronic version to view the images in more detail.

**A – B** BSE images showing well-liberated xenotime-Y particles. EDS spectra from the xenotime-Y are presented in **S1 – S2**, along with the normalised elemental compositions.

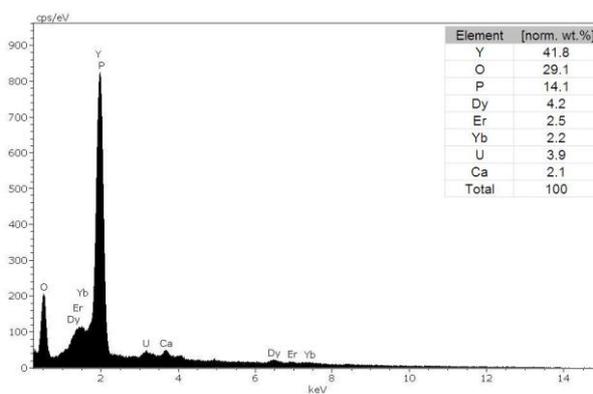
**C** A xenotime-Y particle with a rim of kaolinite/clay minerals.

**D** BSE image showing a large multi-phase particle containing blocky/crystalline xenotime-Y in association with quartz and kaolinite/clay minerals.

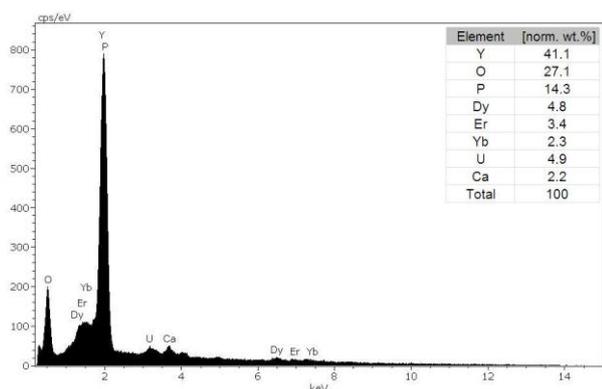
**E – F** BSE images taken at successively higher magnifications showing xenotime-Y in association with gorceixite. An EDS spectrum from the xenotime-Y is shown below in **S4**, along with the normalised elemental composition.



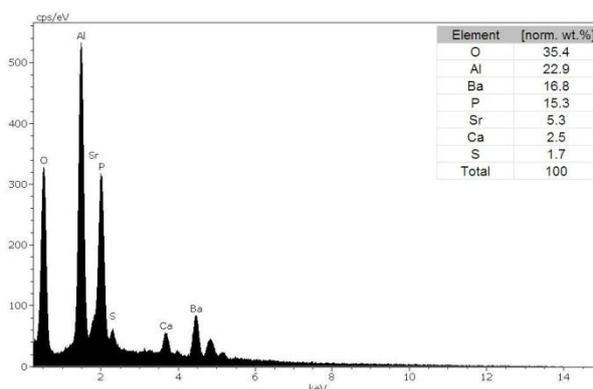
**S1.** An EDS spectrum from the xenotime-Y particle shown in Fig 1A.



**S2.** An EDS spectrum from the xenotime-Y particle shown in Fig 1B.

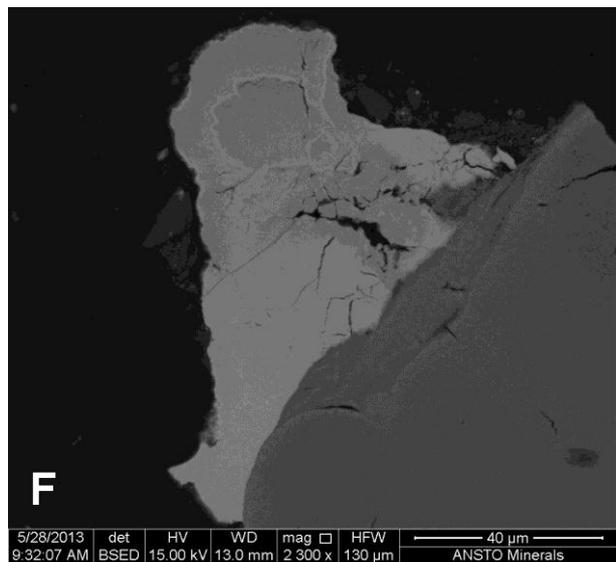
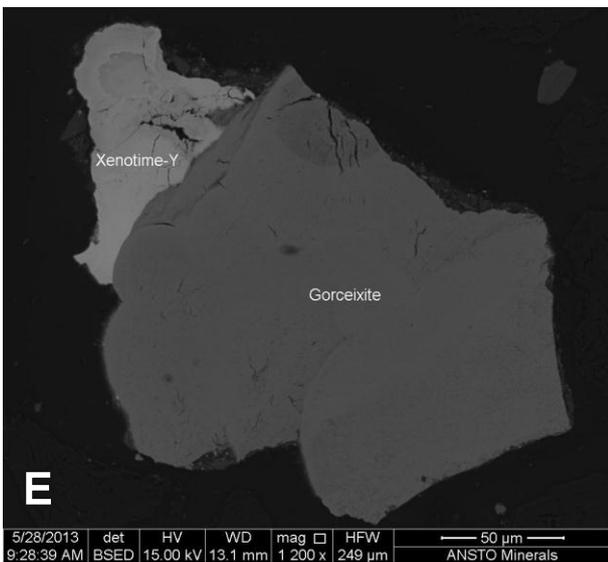
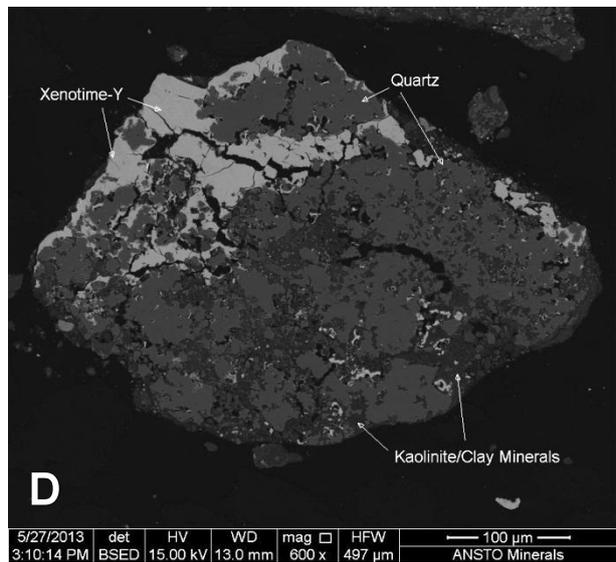
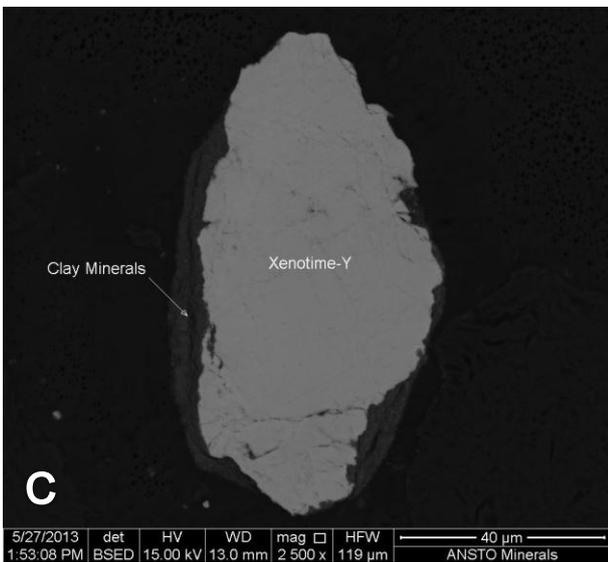
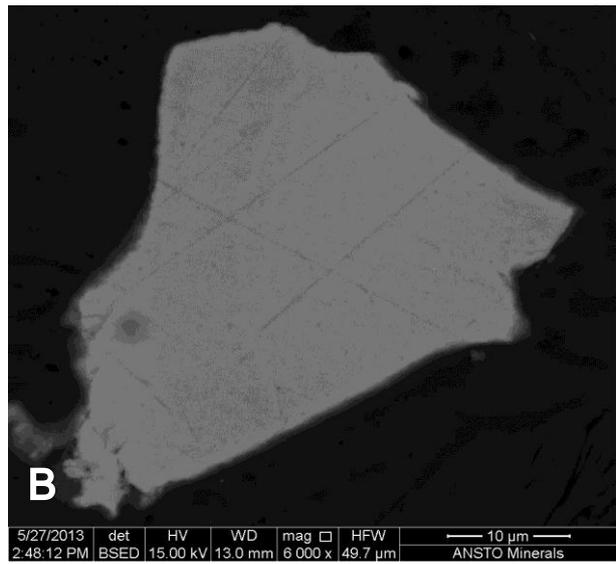
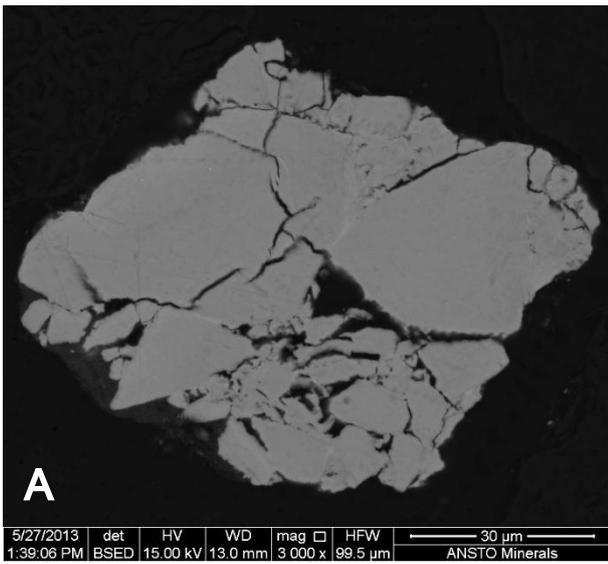


**S3.** An EDS spectrum from the xenotime-Y in the particle shown in Fig 1 E & F.



**S4.** An EDS spectrum from the gorceixite in the particle shown in Fig 1E & F. Note the presence of Ca and Sr.

TUC Resources STDH-03 Sample **Figure 1 A-F**



## FIGURE 2: TUC Resources STDH-03 Sample

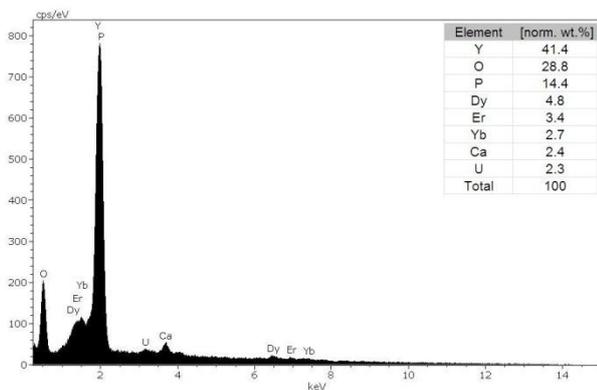
Backscattered electron (BSE) micrographs from the STDH-03 sample:

Use the zoom function on the electronic version to view the images in more detail.

**A – B** BSE images taken at successively higher magnifications showing a multi-phase particle comprising quartz, kaolinite/clay minerals and Y-phosphate. The Y-phosphate phase does not have the usual crystalline appearance of xenotime-Y, rather, it appears to be altered xenotime-Y. An EDS spectrum from the Y-phosphate is shown below in **S5**, along with the normalised elemental composition.

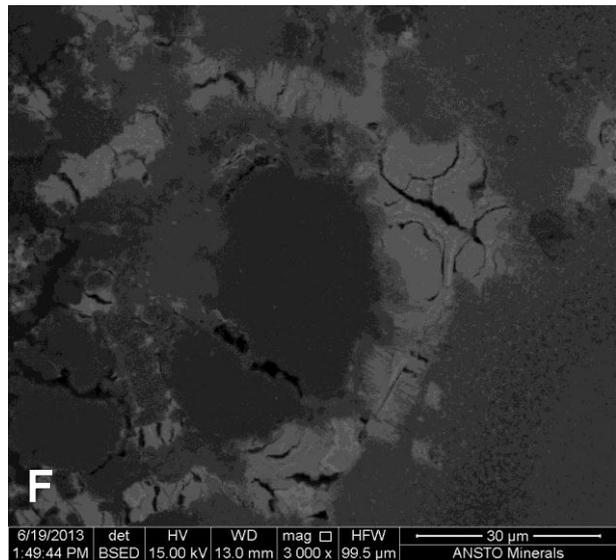
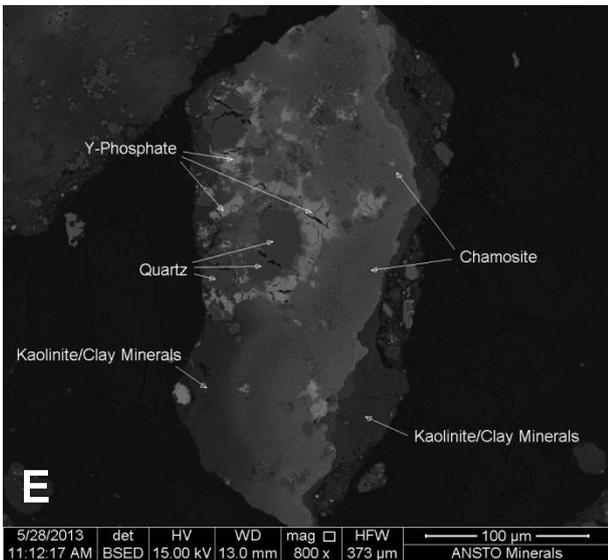
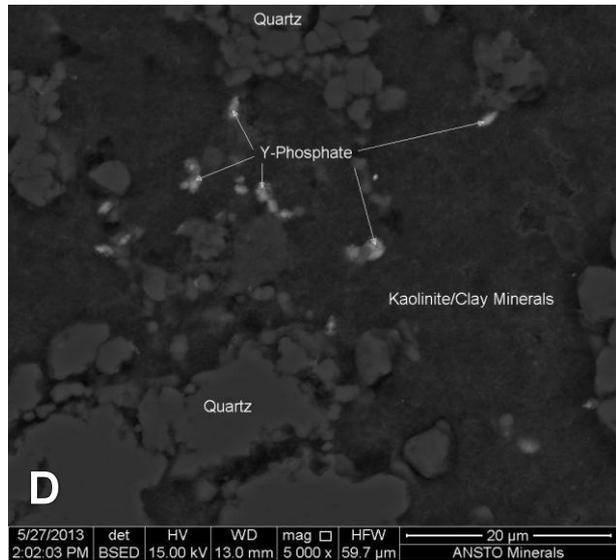
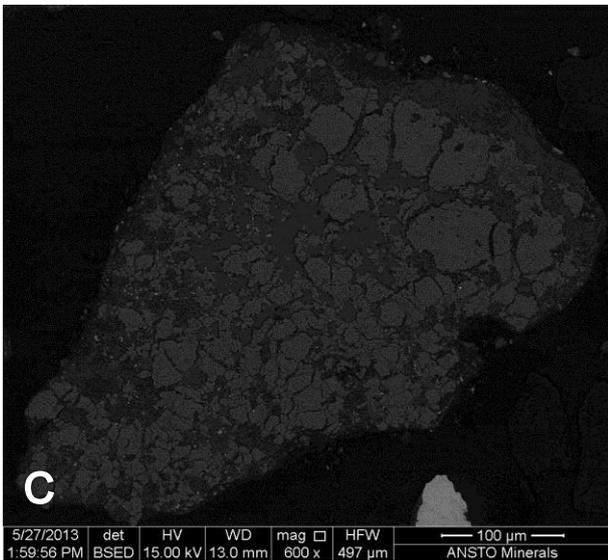
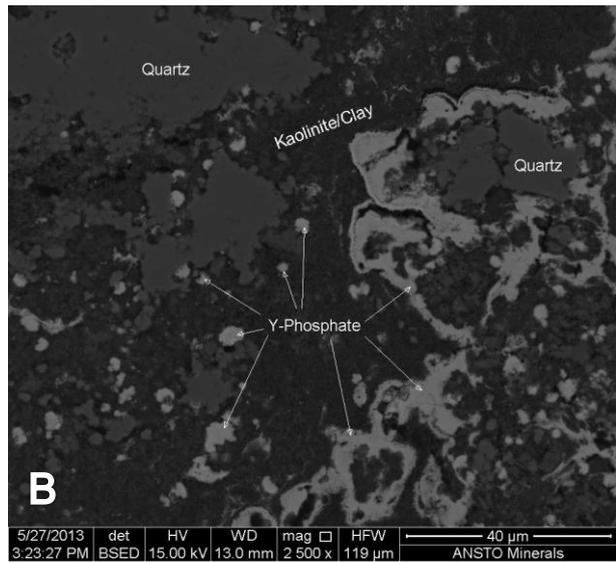
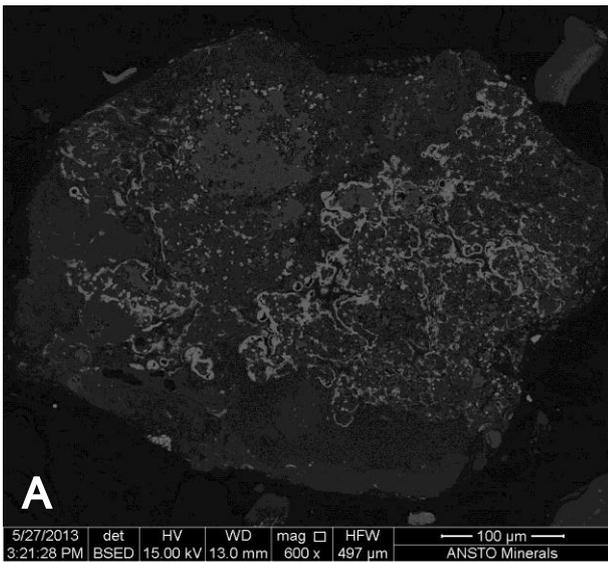
**C – D** BSE images taken at successively higher magnifications showing a particle of quartz and kaolinite/clay minerals that contains very fine Y-phosphate inclusions.

**E – F** BSE images taken at successively higher magnifications showing a multi-phase particle containing Y-phosphate in association with quartz, chamosite and kaolinite/clay.



**S5.** An EDS spectrum from the Y-phosphate phase in the particle shown in Fig 2A & B.

TUC Resources STDH-03 Sample **Figure 2 A-F**



### FIGURE 3: TUC Resources STDH-03 Sample

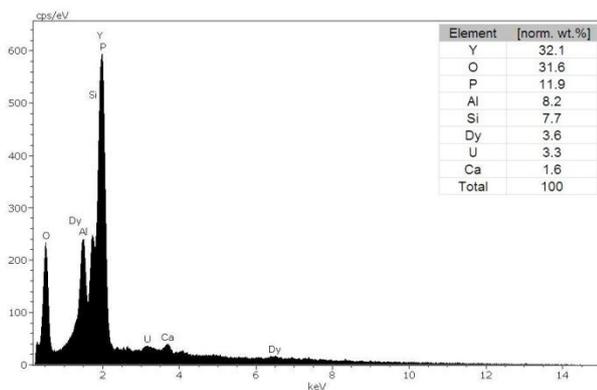
Backscattered electron (BSE) micrographs from the STDH-03 sample:

Use the zoom function on the electronic version to view the images in more detail.

**A – B** BSE images taken at successively higher magnifications showing small ( $< 5 \mu\text{m}$ ) Y-phosphate inclusions in a kaolinite/clay particle. An EDS spectrum from one of the Y-phosphate inclusions is shown below in **S6**, along with the normalised elemental composition. The Al and Si peaks in the EDS spectra are most likely a contribution from the surrounding kaolinite/clay, given the small size of the inclusions.

**C – D** BSE images showing further examples of the spherical aggregate appearance of the fine Y-phosphate inclusions in kaolinite/clay.

**E – F** BSE images taken at successively higher magnifications showing hollow, round Y-phosphate “shells” in a particle comprised of quartz and kaolinite/clay.



**S6.** An EDS spectrum from an Y-phosphate inclusion in the kaolinite/clay particle shown in Fig 3A & B.

TUC Resources STDH-03 Sample **Figure 3 A-F**

