

Deposit Material for Ciobanu et al., AugSept American Mineralogist
Deposit item AM-12-080; Gold-telluride nanoparticles revealed in arsenic-free pyrite

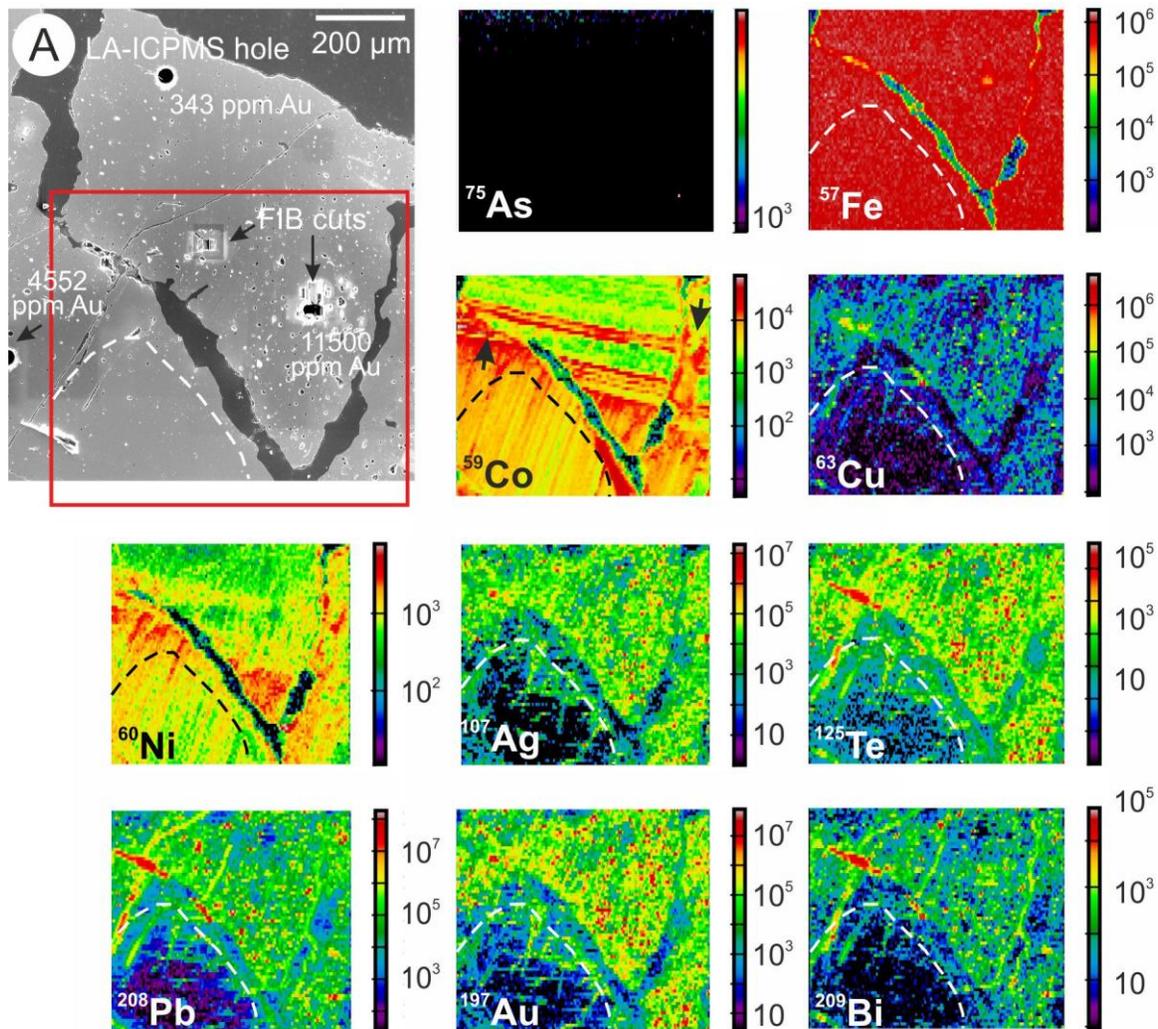
REPOSITORY ITEM 1: EXPERIMENTAL METHODOLOGY

The LA-ICP-MS element map (Fig. 1) was performed using the New Wave UP-213 Laser, coupled to an Agilent HP 4500 Quadrupole ICP-MS at CODES (University of Tasmania); see Large et al. (2009). Trace element maps were generated by ablating sets of parallel lines in a grid across the sample. The lines were ablated at a frequency of 10 Hz, with a beam size of 10 μm , rastering at 10 $\mu\text{m}/\text{s}$.

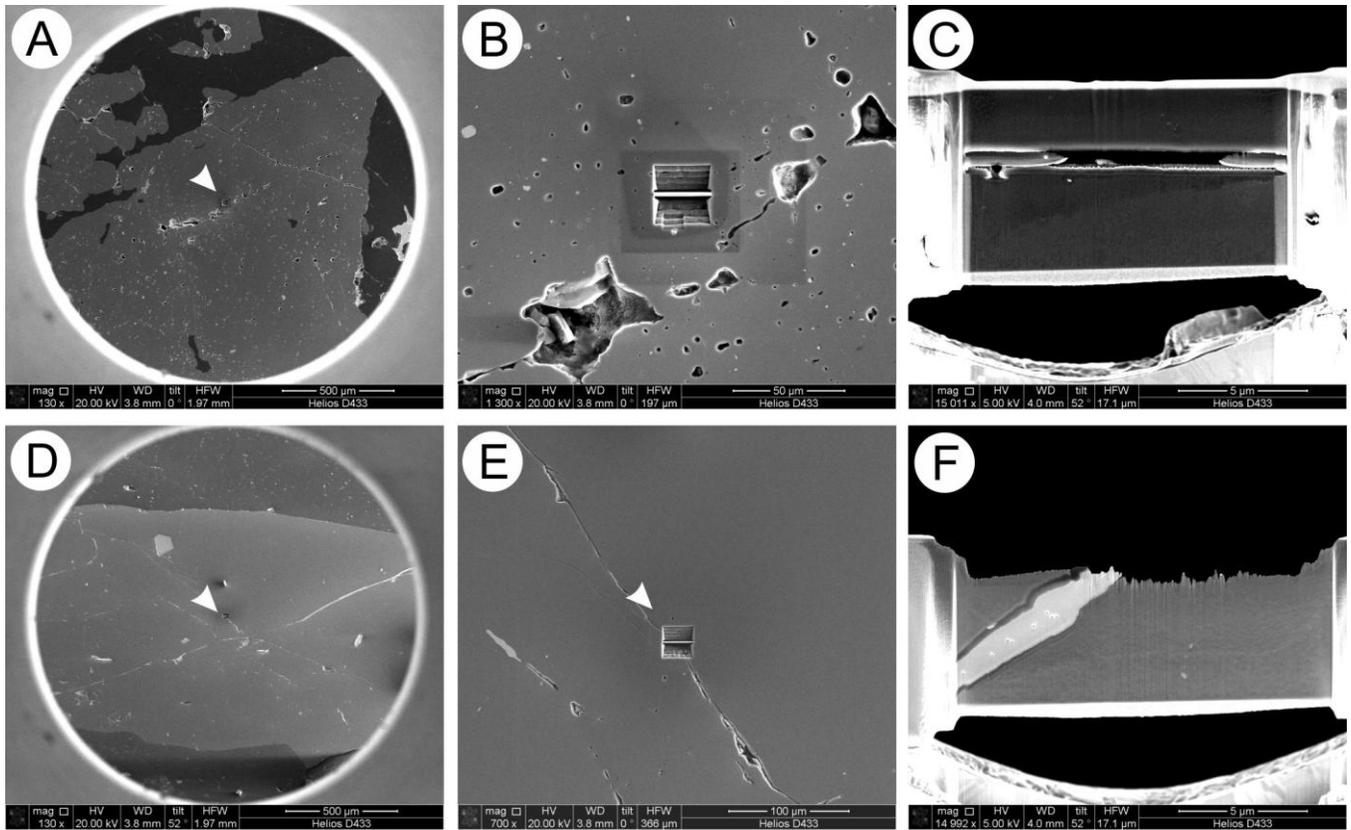
The Dualbeam FEI Helios Nanolab 600 at Adelaide Microscopy was used for cross-section high-resolution secondary electron imaging and TEM foil preparation. Gatan precision ion polishing system was also used to prepare the TEM thin foils.

Three TEM instruments at Kyushu University, Japan were used. These are the Tecnai 20 and Tecnai F-20 instruments, both equipped with a double-tilt holder and Gatan digital camera and operated at 200kV for electron diffractions and high-resolution imaging. Measurements on the diffractions were performed using DigitalMicrograph™ 3.11.1. The third instrument is a high-voltage JEOL JEM 1300NEF instrument, equipped with omega-type energy-filtering system (subtracting inelastic scattering and obtaining elemental map and EELS). Winwulff® 1.4.0 (JCrystalSoft) was used to index electron diffraction patterns.

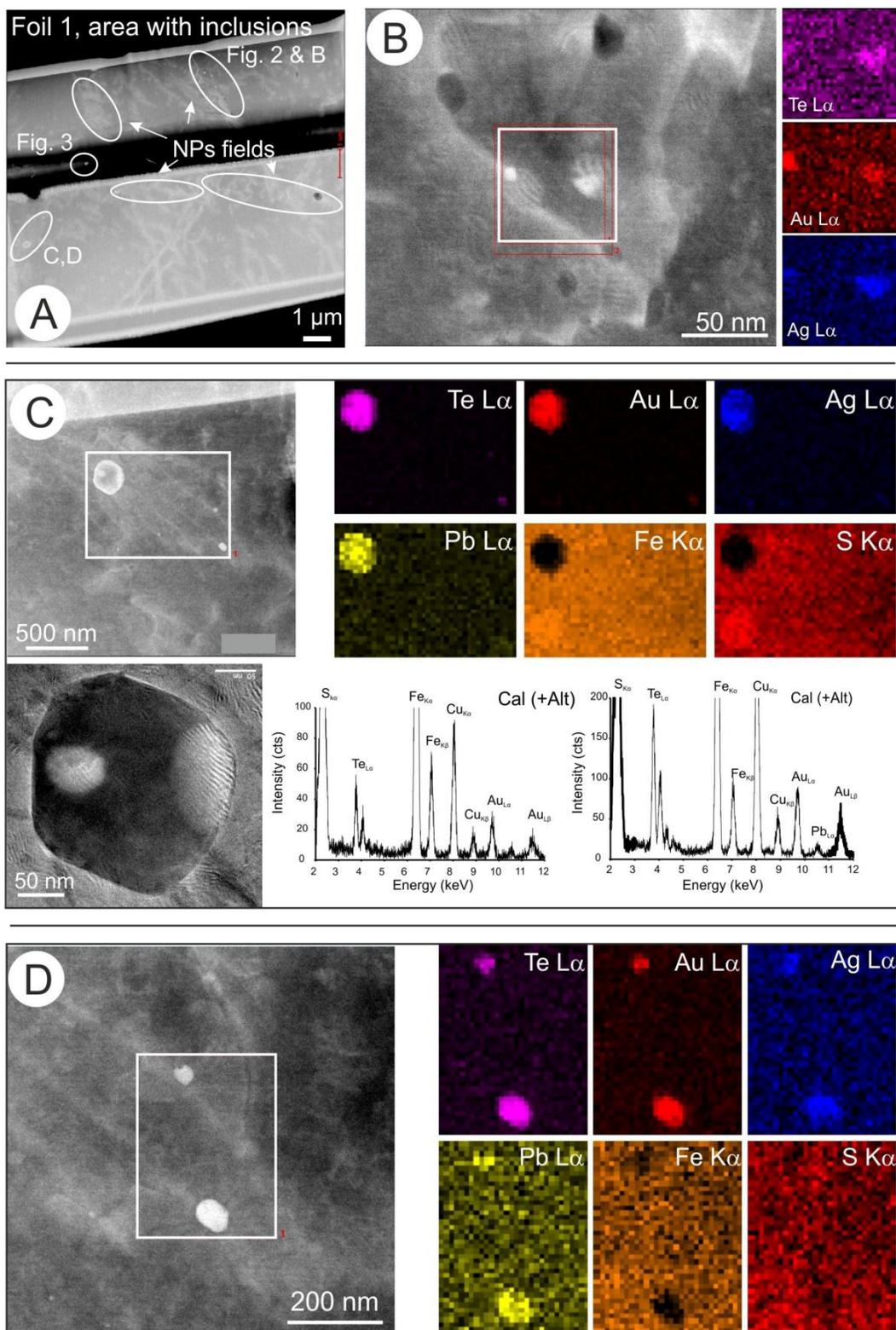
REPOSITORY ITEM 2. (A) Secondary electron image of fractured pyrite and location of element maps (red square). (B) LA-ICP-MS element maps generated at CODES (University of Tasmania). Scale represents counts per second; Ni and Co concentrations are both tens of ppm (Cook et al. 2009b). Dashed line marks the inclusion field.



REPOSITORY ITEM 3. Location, textural context and TEM foils with NPs imaged in this paper. **A-C** Foil with NPs (shown in Figs. 1-3 & Repository Item 4) obtained from an area with clustered inclusions after lifting & thinning of slice imaged in figure 8a from Ciobanu et al. (2011). **D-F** Foil with NPs from outside an area with clustered inclusions but adjacent to 2- μ m width fractures (shown in Repository Item 5).



REPOSITORY ITEM 4: **A** HAADF-STEM image of foil 1 from n area of clustered inclusions hosting NPs. **B** HAADF-STEM image of small square area in Fig. 1A containing two of the smallest NPs and STEM-EDX element maps of the white square. **C and D** HAADF-STEM images of other areas on foil 1 containing NPs. TEM-EDX map areas are shown by white squares. A detail of the larger NP in C is shown as a BF-HR-TEM image. Note that there is no inverse contrast to the HAADF-STEM image because of the foil thickness in his area. STEM-EDX spectra obtained as marked show a mixture of calaverite (Cal) and altaite (Alt).



REPOSITORY ITEM 5: Secondary electron FIB image showing location for foil 2 (outside areas of clustered inclusions). (B) HAADF-STEM image showing location of NPs in foil 2 (circled). The arrowed NP is shown in detail in (C). (D) STEM-EDX element maps. Whereas the majority of the NP is composed of a Au-Ag-telluride (sylvanite?), a small volume of altaite (PbTe) is present at the upper left of the NP.

