A guide to SIMS targeting in difficult samples

WiscSIMS

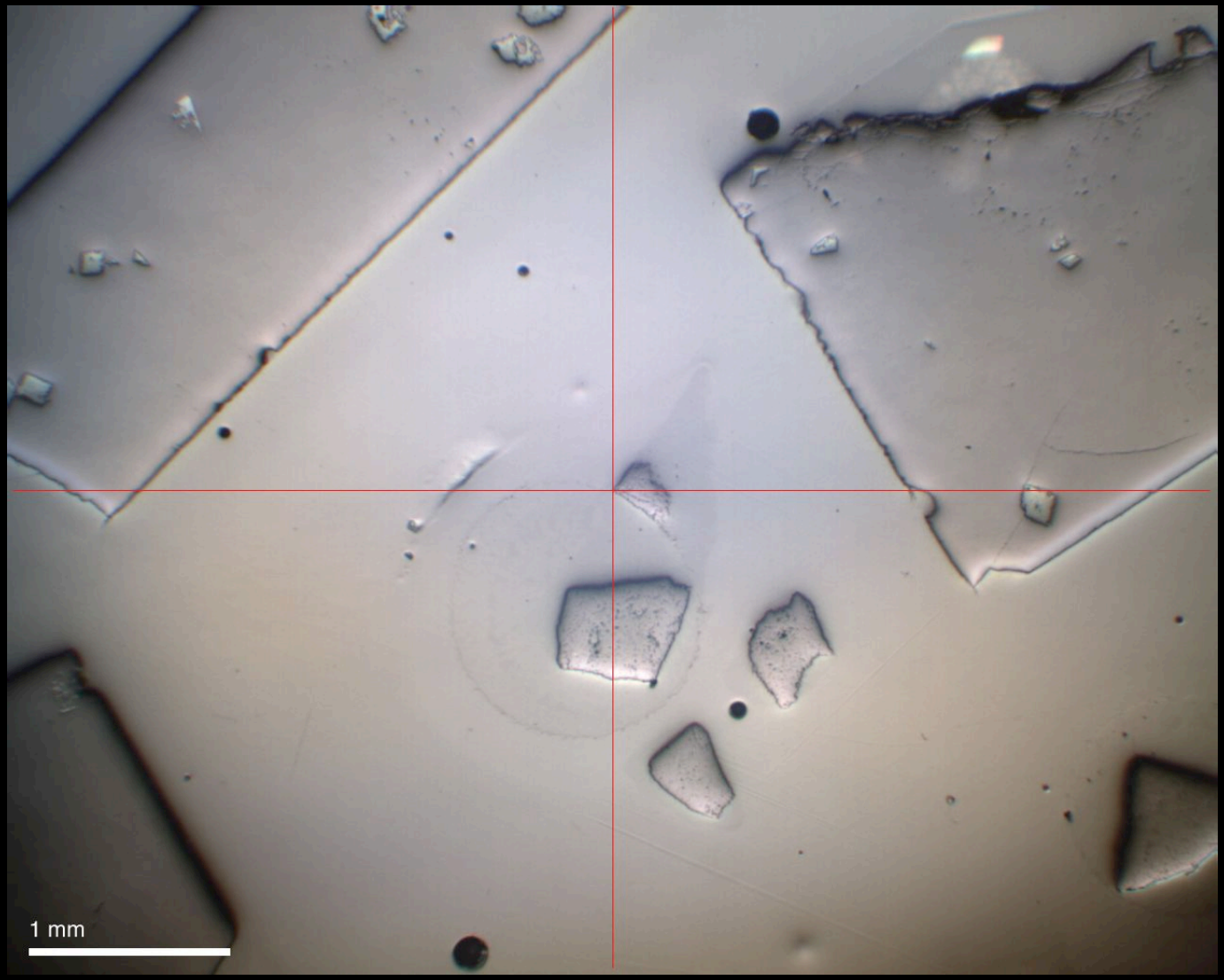
Department of Geoscience
University of Wisconsin-Madison

images and text by K.H. Williford, 2012

A “zero point” is chosen and photographed at low magnification
in reflected light, and again at the same (higher) magnification that will be used to log target coordinates (see pg. 2).

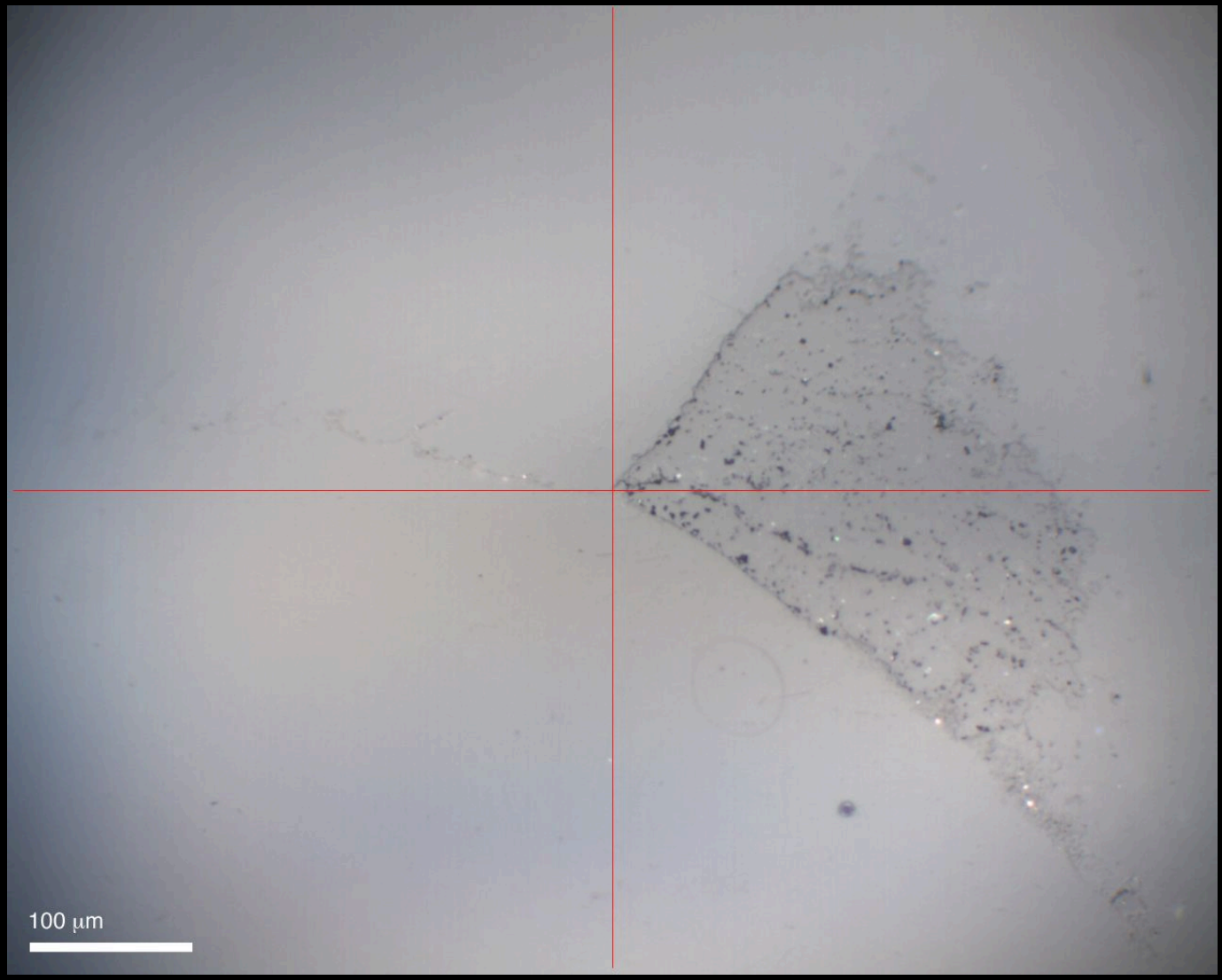
Target coordinates are logged relative to this point (0,0), often a corner of a standard grain near center of the sample.

Red “cross hairs” in this and following images indicate target of interest.



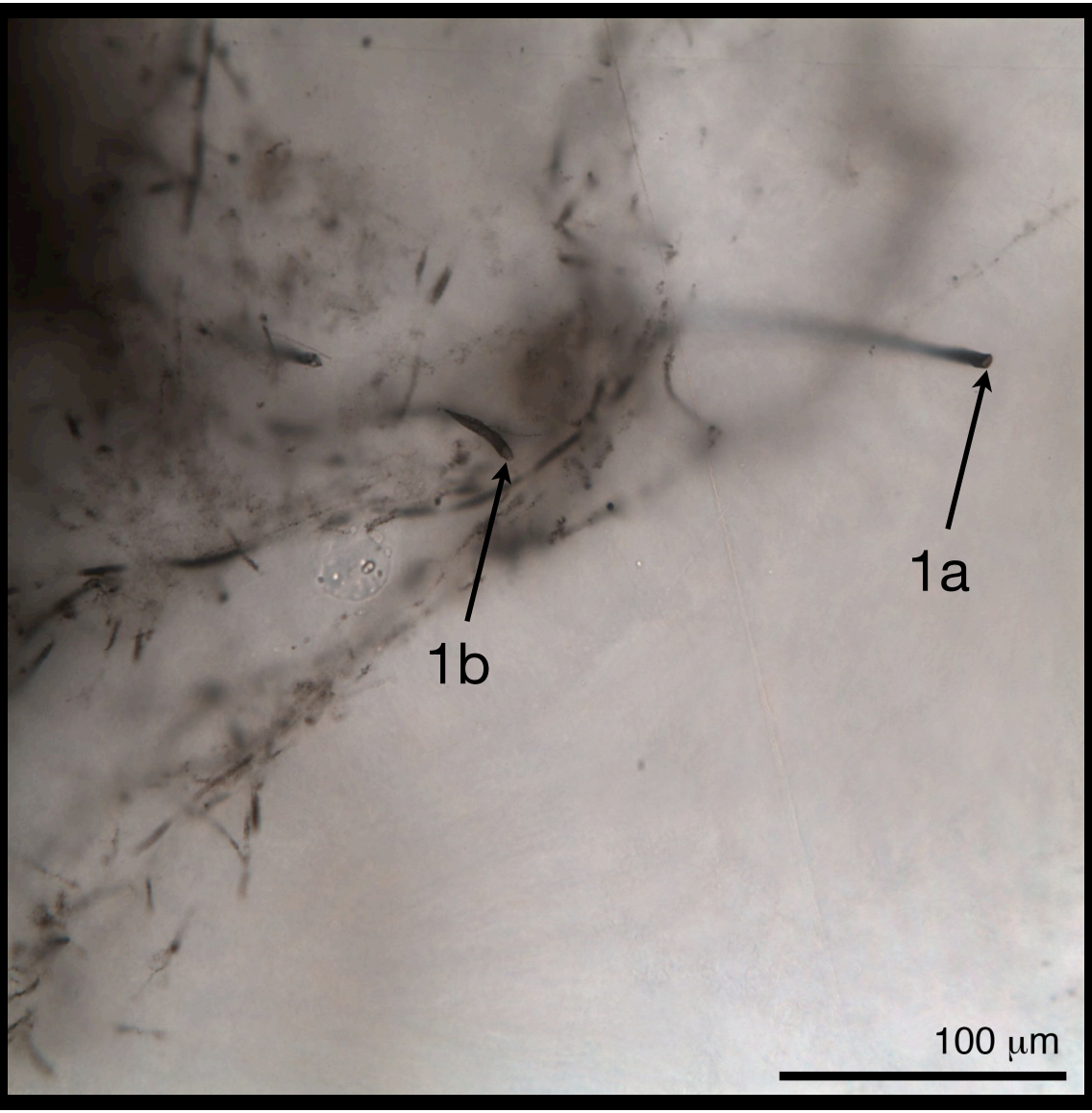
This is the zero point photographed at the same magnification (e.g., 20x objective with 10x ocular) used to log target coordinates and similar to the field of view on the SIMS microscope targeting system (see pg. 14). The digital stage is set to 0,0 here, and target coordinates are logged relative to this point.

We navigate to this point on the SIMS and recalculate target coordinates relative to the coordinates of this point on the SIMS.



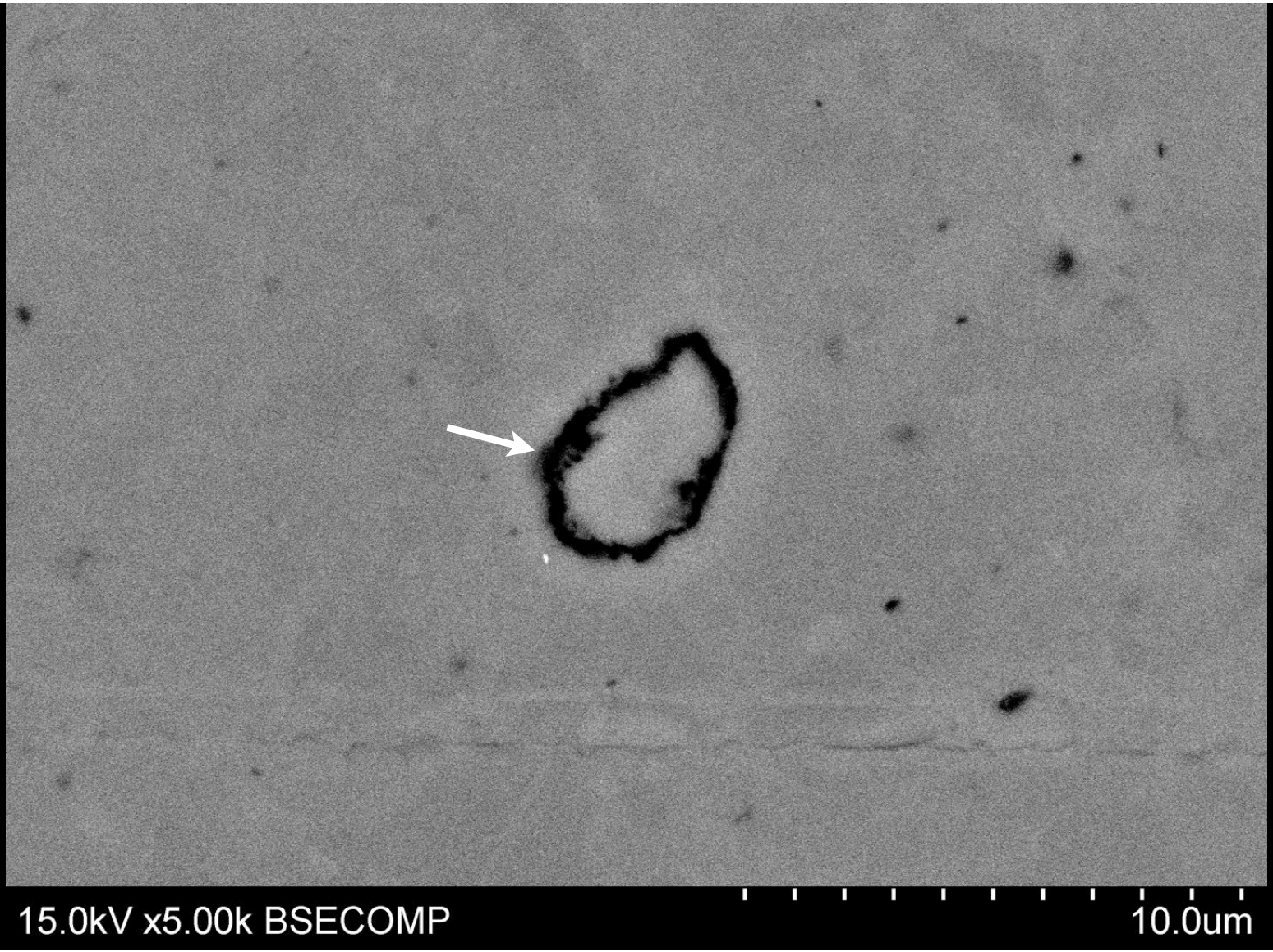
Target area 1

Filamentous Proterozoic microfossils in chert, photographed in transmitted light. A backscattered electron image of target #1a is shown on the following page. In transparent or translucent materials (e.g., chert or quartzite), surface exposure of targets should be verified by reflected light microscopy and electron microscopy.



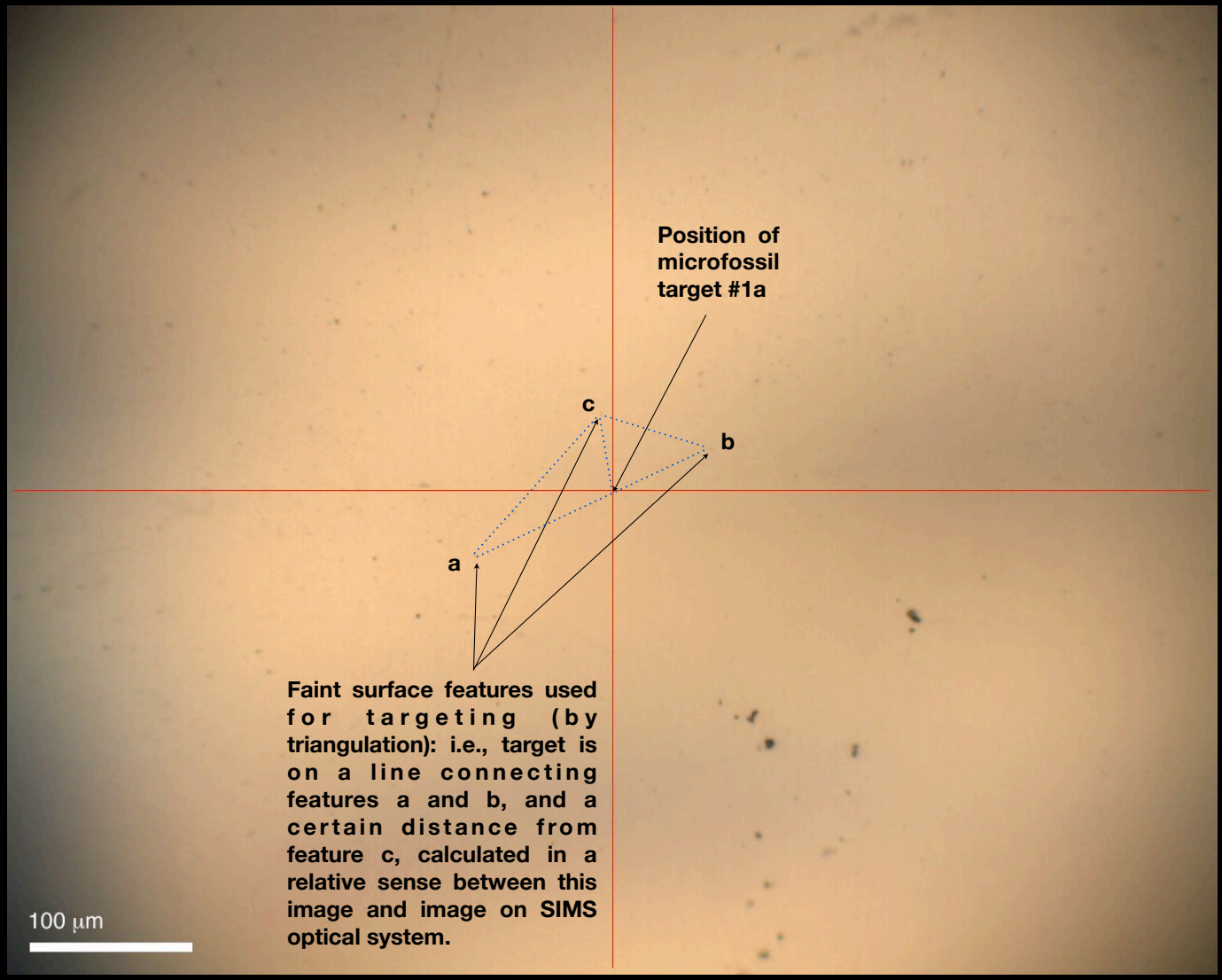
Target #1a

Filamentous Proterozoic microfossil in chert (shown in transmitted light, pg. 3), intersecting the surface of a thin section and imaged at high magnification in backscatter mode on a scanning electron microscope to show distribution of organic matter at the surface of the sample.

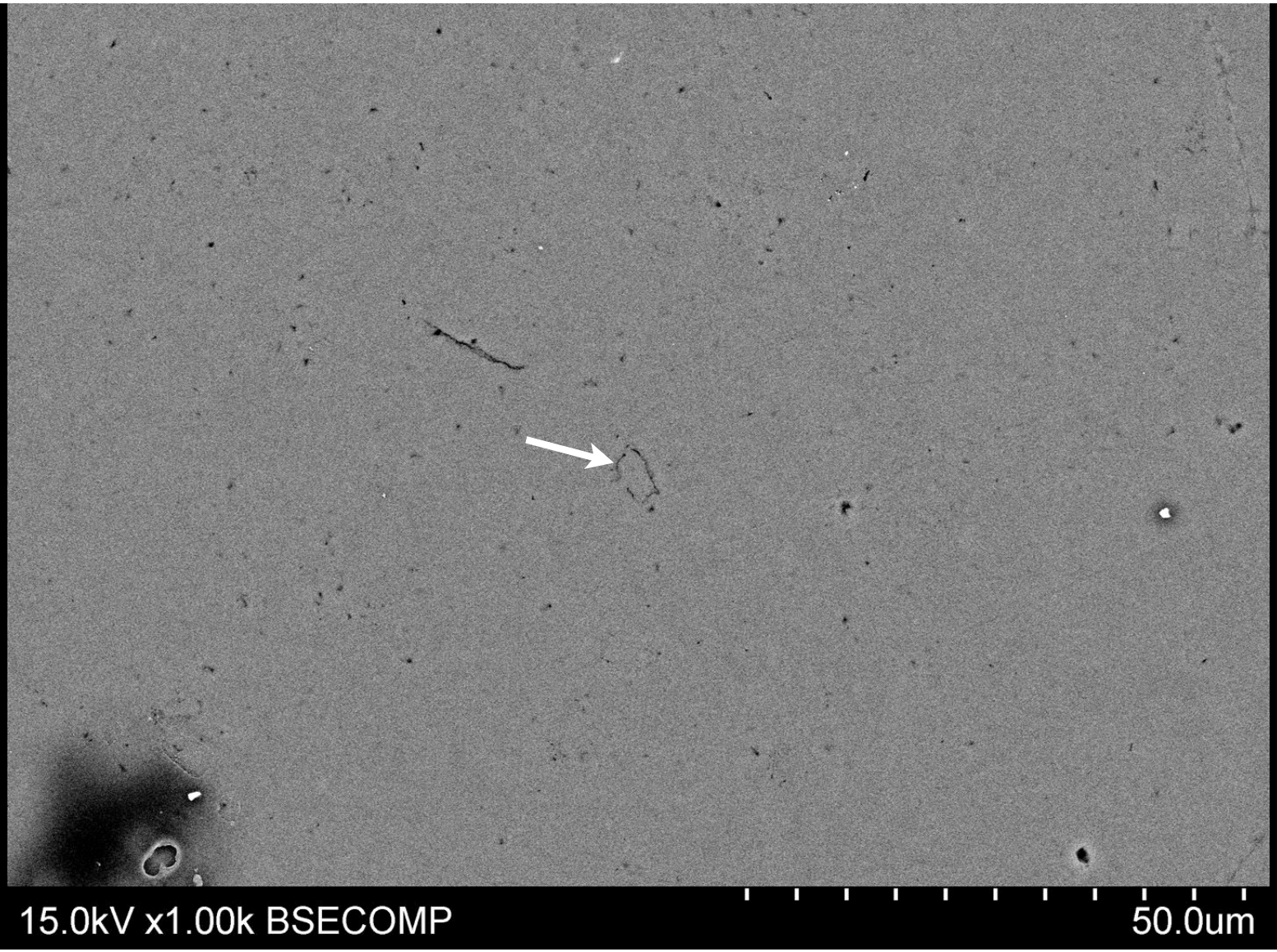


Target #1a

After gold coating and loading the sample into the SIMS sample holder, targets are photographed in reflected light (e.g., using a 20x objective), and all coordinates are relogged to account for any rotation that occurs between initial targeting and inserting sample into SIMS sample holder. These coordinates, relative to the zero point are used for targeting on the SIMS, and surface features shown in this image are used for aiming. No organic matter, and few surface features are visible on the surface of this chert sample after gold coating, and care must be taken to acquire sufficient reflected and transmitted (where appropriate) light, as well as backscattered and secondary electron images at various magnifications so that features can be recognized on the SIMS optical system.

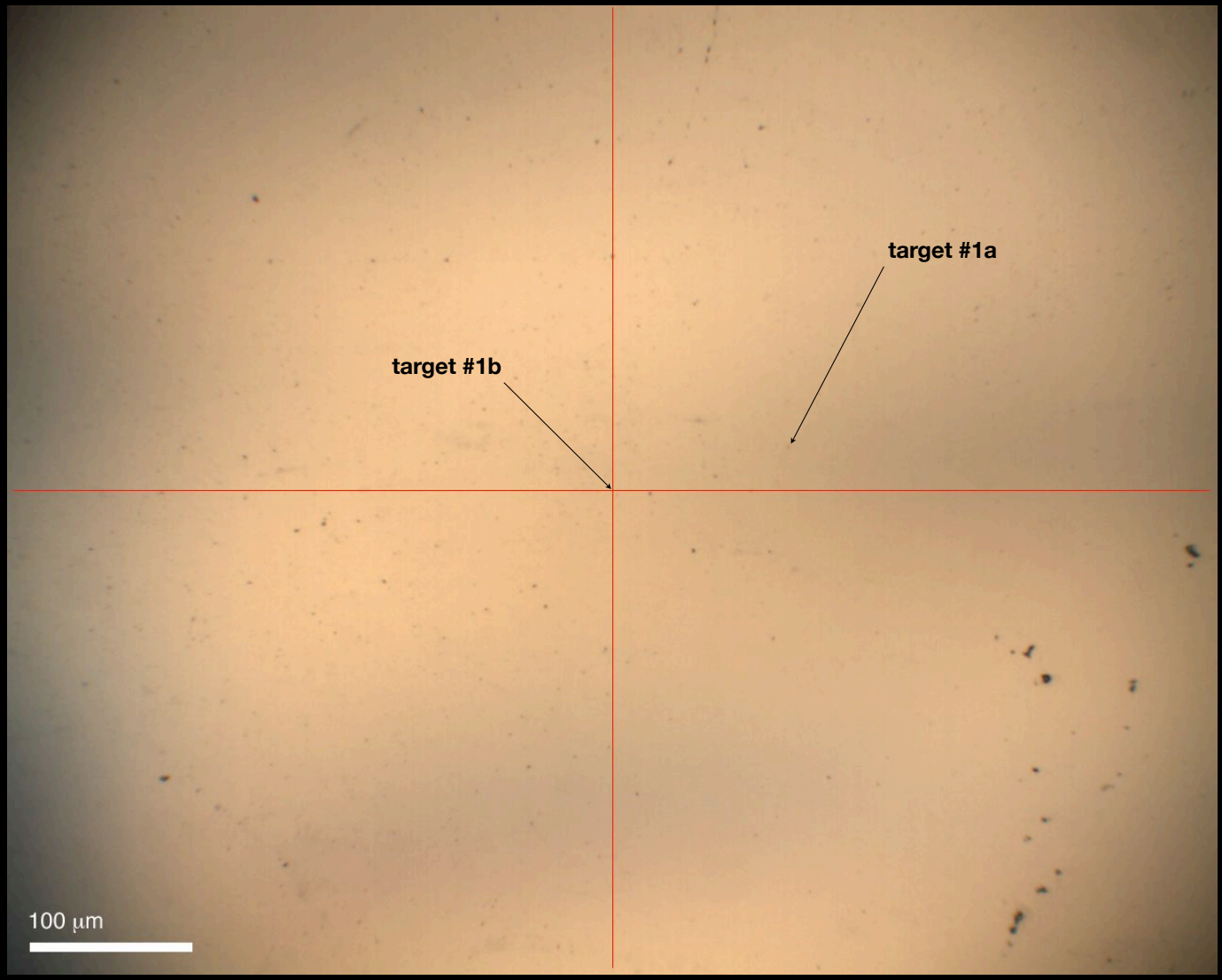


Target #1b

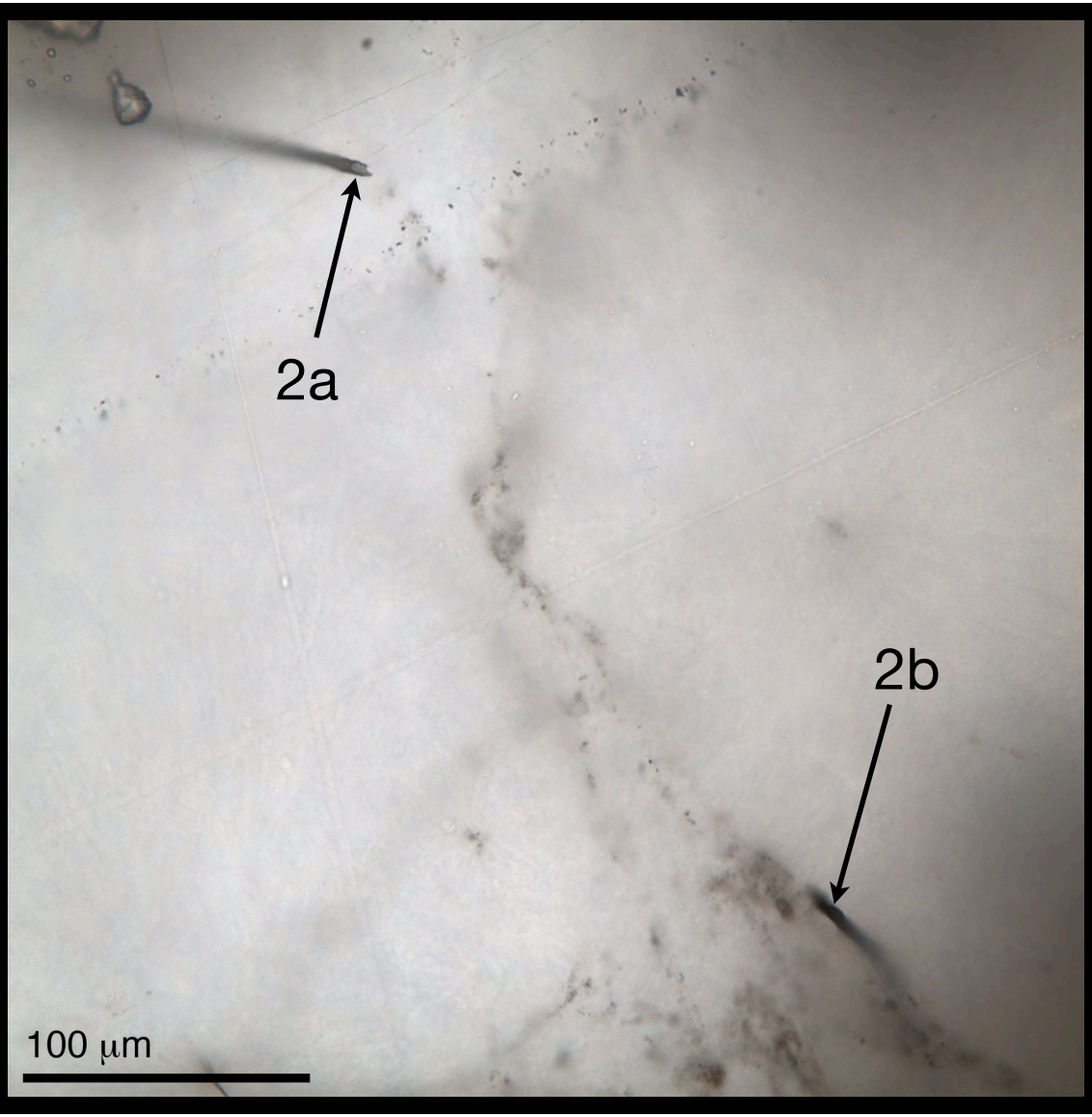


6

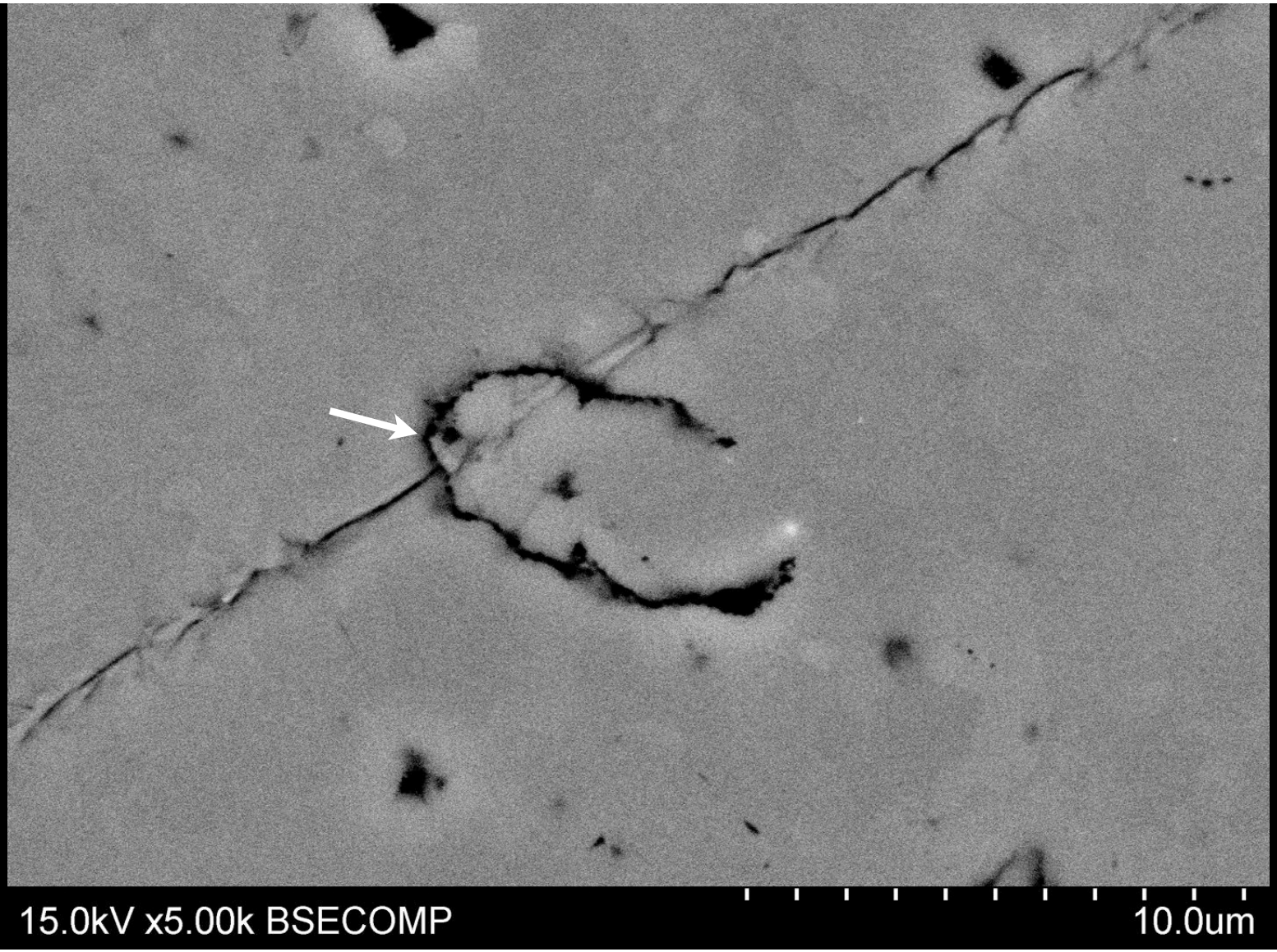
Target #1b



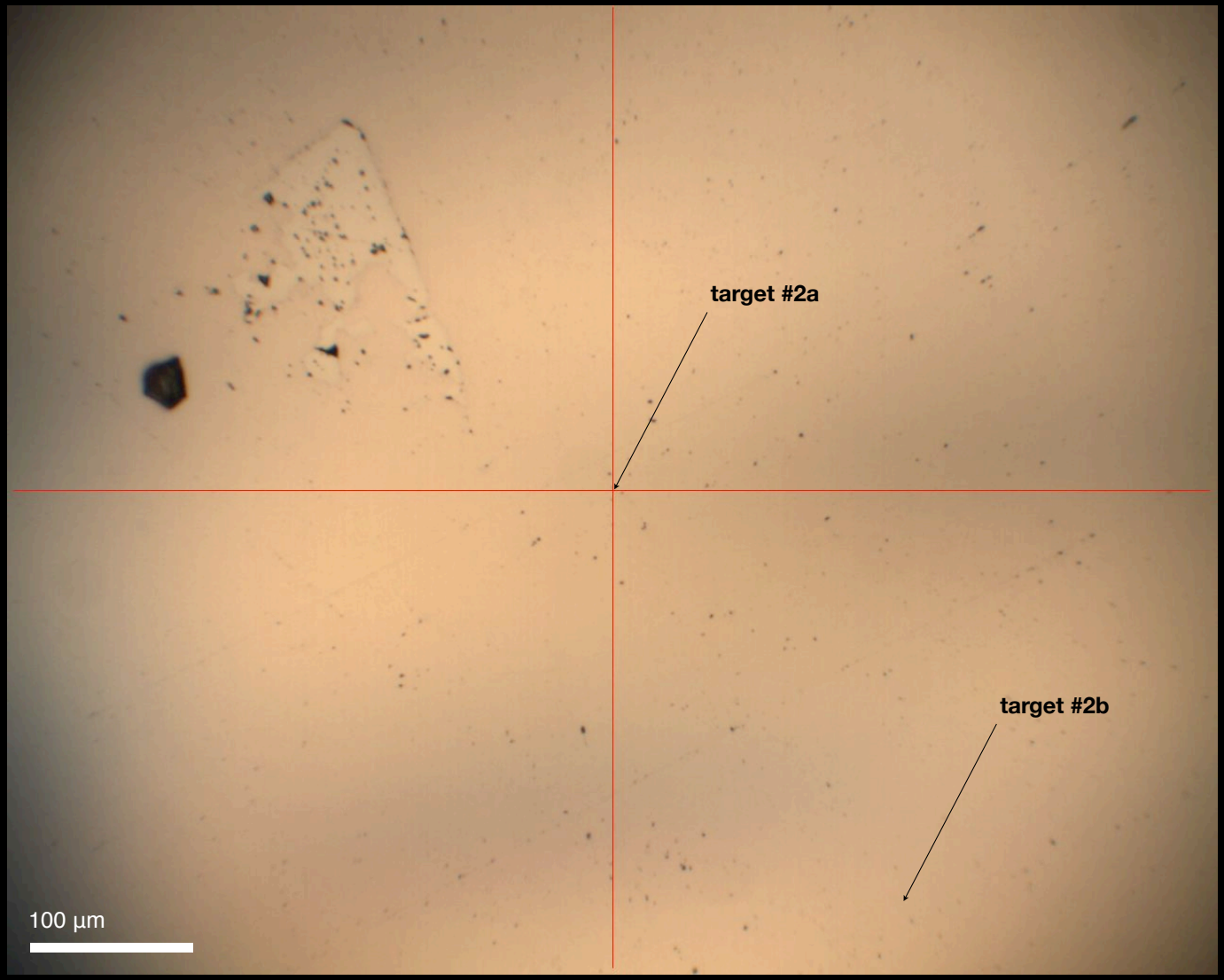
Target area 2



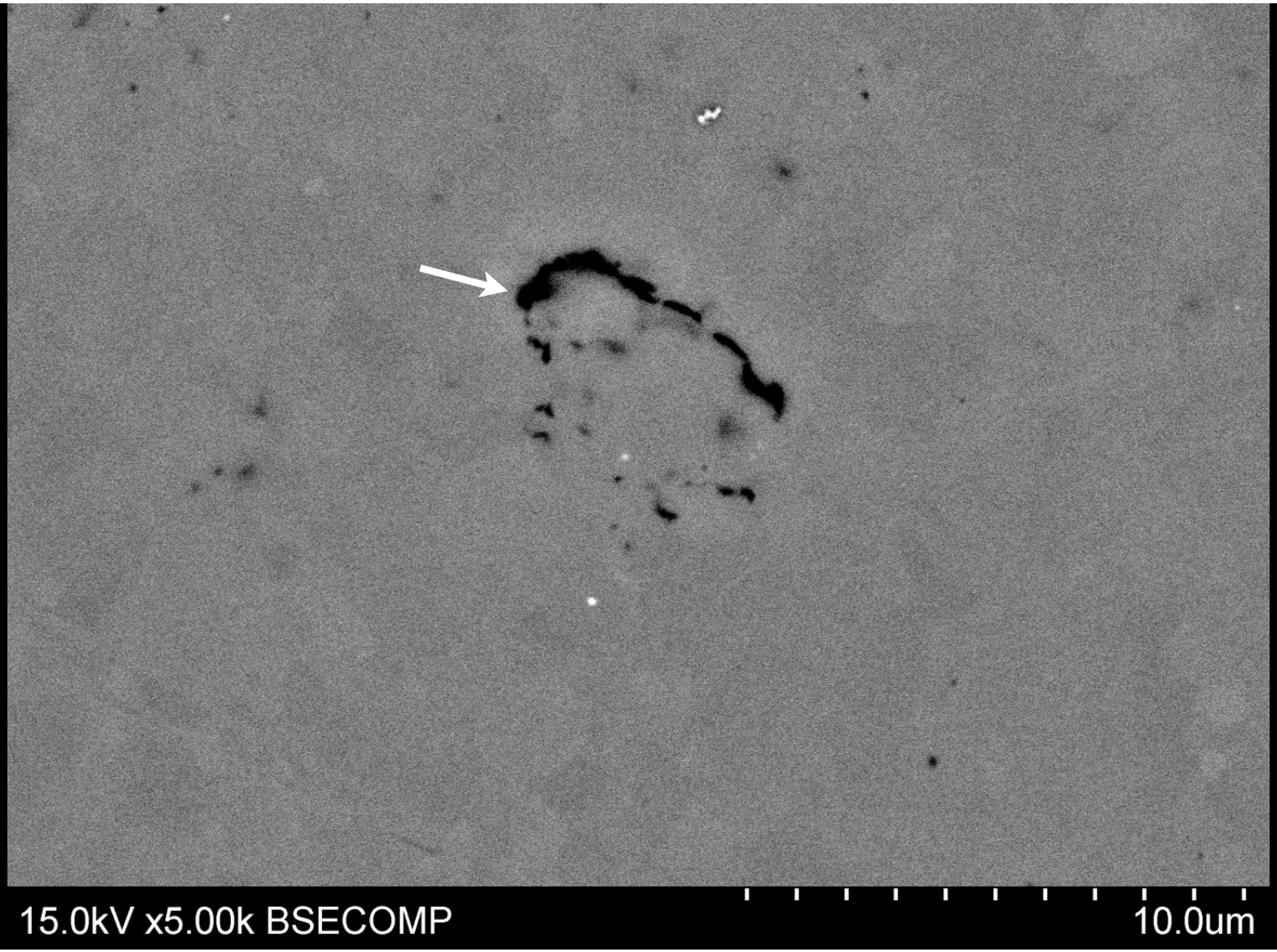
Target #2a



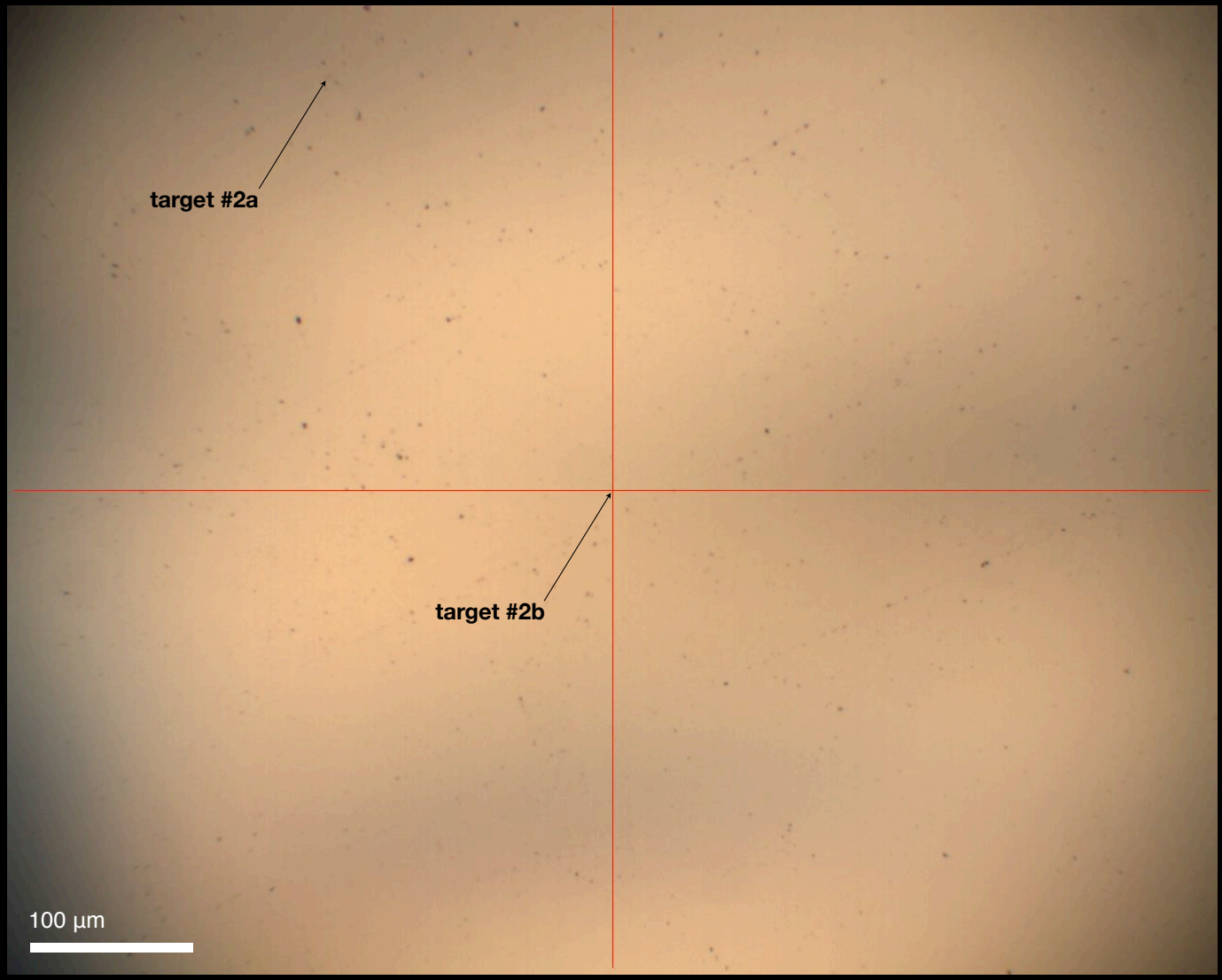
Target #2a



Target #2b

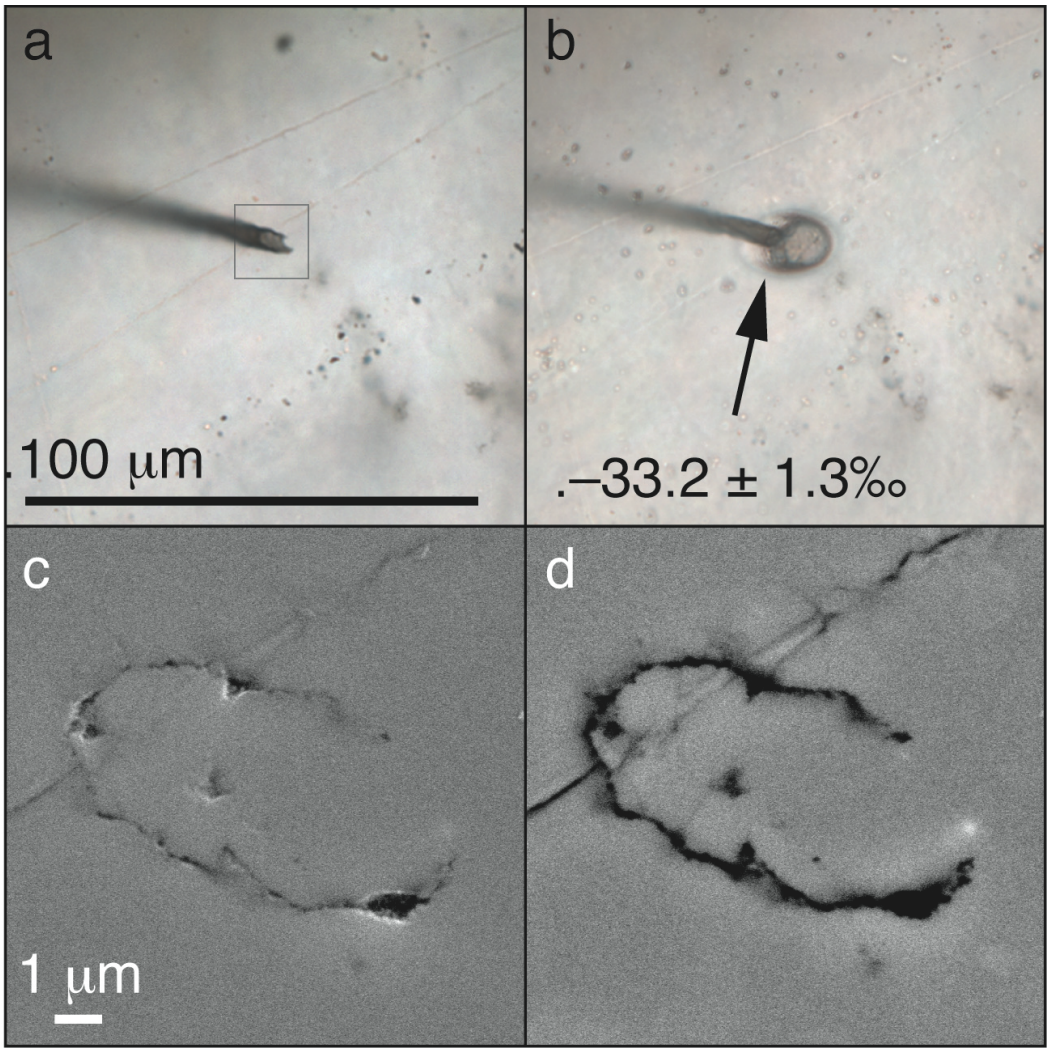


Target #2a



Example publication figure showing transmitted light (a, b), secondary electron (c), and backscattered electron (d) images of representative target (2a). Panels c and b are enlargement of target #2a, shown before and after analysis in in panels a and b, respectively. Panel b shows analytical pit, and $\delta^{13}C$ value (‰ VPDB) of this microfossil is indicated.

High magnification backscattered electron post-analysis pit images of all targets are published in a supplement.



Screen capture from the SIMS microscope targeting system (field of view ≈ 450 µm) showing 15 micrometer spot after analysis. Note the difference in image quality between the SIMS optical system and a dedicated reflected light microscope (pg. 1-2), a factor that can contribute to difficulty in targeting during the analytical session.