Micro-computed tomography as a pre-screening tool for destructive microscopy modalities

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While MicroCT has been used as a correlative technique for complementary microscopy techniques, its use as a pre-screening tool is still comparatively underutilised. The ability to perform non-destructive pre-screening on samples can serve as a process to minimise ultimately unsuccessful imaging sessions through the vetting of the sample preparation, or ensuring the presence and identification of the location of features of interest.

In research the two highest value resources are the sample and time, both of which are often irreplaceable. With respect to the sample, many of the conventional three-dimensional imaging techniques - focussed ion beam or serial array tomography for example - require permanent modification to or destruction of the sample. In cases of unique samples imaged in this manner, it is essential to ensure that the region of interest is imaged accurately in the first instance as there are no further opportunities. Also, with any form of milling or serial sectioning, there is a chance that the features of interest occur in the plane between imaging points and as a result the useful data is not collected. Furthermore, the act of cutting or milling into the sample itself can introduce artefacts that may be misinterpreted as true features during analysis.

The use of these techniques can also take considerable time with no guarantee of a successful result, especially if the sample has been inadequately prepared, or if the feature of interest is not present.

Several examples will be presented with samples from both materials science and biological research areas to highlight the benefit of including microcomputed x-ray tomography as a key part of a destructive three-dimensional imaging workflow.

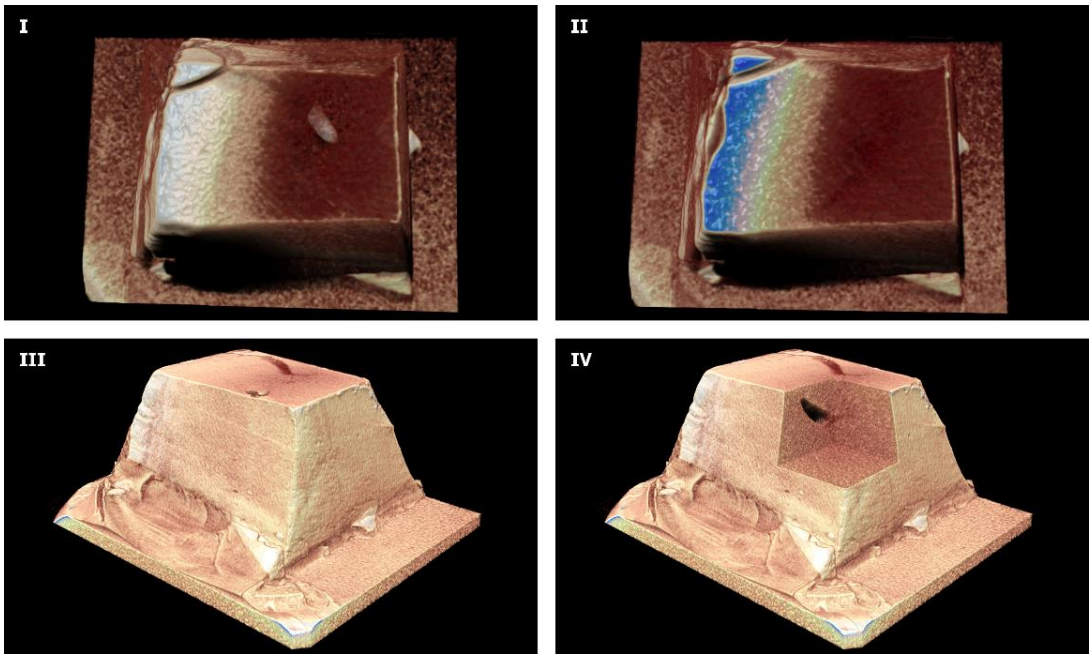

Figure 1: Tissue prepared for Serial Block-Face Scanning Electron Microscopy

I & II: Rendering of sample in top and cut-away views highlighting non-ideal diffusion gradient of staining reconstructed from a survey scan (blue indicates contrast agent saturation)

III & IV: Full and cutaway view of a detailed scan of the same sample within which an internal region of interest (void space) is visible