USING FIB/SEMs TO INVESTIGATE BIOLOGICAL SAMPLES

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FIB/SEMs, which combine a Scanning Electron Microscope (SEM) and a Focused Ion Beam (FIB) in a single device have become the "go to" tool in the materials sciences and semiconductor industry. Their unique capability set - revealing a sample's subsurface structures at high resolution, preparing TEM-lamellas, as well as reconstructing 3D sample models at precisely selected points within the sample (slice and view process) cannot be achieved by other technique. This tool has recently found increasing interest in the life sciences (1-8). However, appropriate milling and imaging parameters for soft materials like polymers and non-resin-embedded biological samples are not yet well known. Generic parameters which are used for hard materials cause heat damage and produce undesired artefacts in the samples.

This study focuses on gallium ion-solid interactions to derive sets of suitable operational parameters and a technique, based on Fourier's law of conductive heat transfer and Monte Carlo simulations, which prevents heat damage in soft materials. The technique is successfully demonstrated on non-resin embedded collagen, a biomaterial which serves as a case study for other soft tissues.

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