

Three-dimensional densitometry imaging of diatom cells using STIM tomography

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Scanning transmission ion microscopy tomography (STIM-T) was carried out on diatom cells with the aim of displaying their 3D structure and performing density measurements on their silica skeleton. Two software packages were compared for data reduction: TomoRebuild, based on a simple filtered backprojection algorithm, and DISRA, an iterative program. Silicon carbide microfibres of known density were also analysed as reference specimens. Similar results were obtained with both algorithms, demonstrating the ability of STIM-T to provide density measurements at the cell level without requiring any standard calibration samples. This unique feature stresses the interest of STIM-T to accurately normalise X ray emission micro-tomography data from synchrotron radiation (SXRF: synchrotron radiation X-ray fluorescence) or ion beam sources (PIXE: particle induced X-ray emission). Possible enhancements of the DISRA code are discussed in order to facilitate its use for the reconstruction of future PIXE/STIM tomography data. A "nanoprobe" coupled to a Singletron (R) accelerator, allowing a spatial resolution of a few tens of nanometers, is going to be built in the coming months at the Centre d'Etudes Nucleaires de Bordeaux Gradignan (CENBG). This new facility will bring promising applications in imaging and analysis at the sub-cellular level.