Scanning Electron Microscopy of Silicified Wood in Paleobotany: Fine Structure and Tissue Substitution by Minerals

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The silicified wood from the Madagascar not only had been substituted and crystallized by minerals under certain conditions for long time, but also had maintained the exterior morphology of once grown trees. It showed typical inner structures of conifers considered. This research was performed by scanning electron microscopy with X-ray microanalysis. Results showed that radial planes of the silicified wood had tracheids as a major component of the axial system in the xylem. Tracheids were mainly characterized by numerous bordered pits where a thickening in the middle (torus) was surrounded with the membrane (margo). The torus appeared to contrast with the fibrillary network of the margo. As a component of the axial system in the phloem, sieve elements were found to have many sieve pores that were filled with either crystallines or amorphous materials. To correlate the colors of the silicified wood with elemental composition, energy-dispersive X-ray spectrometry was employed in this study. Silicon was present as a basic component of the silicified wood. Calcium and iron were detected from red-colored crystalline regions whereas, magnesium was found in blue-colored crystalline regions. These results suggest that tissues of silicified wood had been substituted by minerals over the past period, while retaining the inherent morphology of the tree species. Scanning electron microscopy and X-ray microanalysis could be applied to unravel structural details and composition of plant fossils in paleobotany.

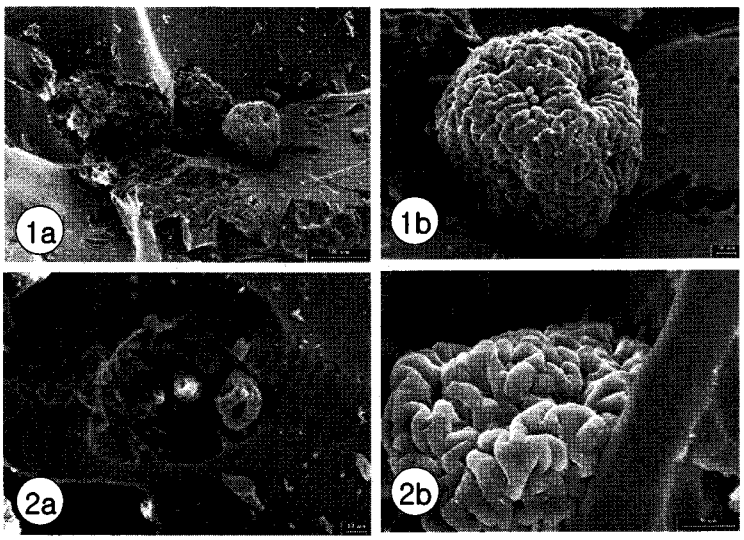

Fig. 1 and 2. Electron micrographs showing a component of the axial system in the phloem. There were a few brain-like wrinkled crystallines in the lacuna.

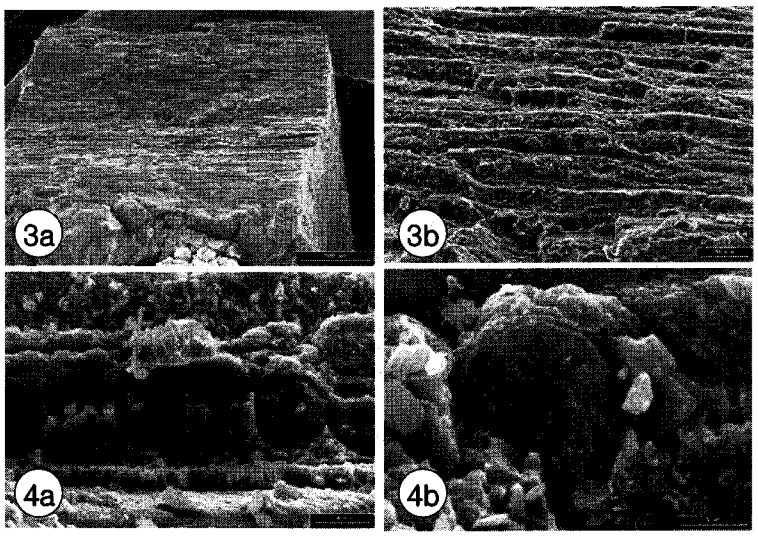

Fig. 3 and 4 (higher magnifications). Electron micrographs showing silicified wood that had been substituted by minerals over the past period. The plant cell-shaped structures (tracheids) on the fracture plane disclosed the inherent morphology of the tree species.