A NOTE ON THE APPEARANCE OF SCLEREIDS FROM WESTERN HEMLOCK INNER BARK[1]

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ABSTRACT

Scanning electron microscopy was used to illustrate the appearance of individual sclereid cells isolated from the inner bark of western hemlock (*Tsuga heterophylla*). Interlocking of adjacent cells to form a solid sclereid group and presence of pits are seen clearly using an SEM rather than a light optical microscope.

Additional keywords: *Tsuga heterophylla*, SEM, anatomy, ultrastructure.

INTRODUCTION

Chang (1954a) has described the "branched and twisted" shapes of individual sclereid cells that form the sclereid groups of 10 to 20 cells found throughout western hemlock inner bark. His photomicrograph shows the distribution of sclereid groups in a cross section of the bark. A photomicrograph of a radial section through a sclereid group of *Abies grandis*, which has a general structure similar to that of hemlock bark (Chang 1954b), shows the irregular size and shape of the individual sclereid cells in cross section. Den Outer (1967) shows a drawing of a cross section through a group of thick-walled sclereids of *Tsuga canadensis*. None of these cross sections shows the shape of the individual sclereid cell.

In the course of work on whole tree utilization, we have isolated sclereid groups from the inner bark of western hemlock. Delignified samples of inner bark were treated with cupriethylenediamine (cuene) solution in order to dissolve the fibrous material surrounding the sclereid groups. This treatment caused the sclereid groups to break up into individual cells which clearly revealed their irregular appearance. Because visible light photomicrographs lacked the necessary depth of focus to show the three-dimensional shapes of the cells, scanning electron microscopy (SEM) was used to show their appearance.

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METHODS

Western hemlock (*Tsuga heterophylla*) inner bark was delignified by a regular sulfite cook and then drastically bleached until nearly white. The resulting material consisted of large numbers of sclereid groups and of some severely degraded fibrous material. Samples were treated under a microscope with various dilutions of 1.0 M cuene solution. A 1:2.5 cuene-water dilution dissolved most of the fibrous material but swelled the sclereid cells only slightly. The cells were washed with water, dilute acetic acid, water, and then dried from acetone. Individual cells and sclereid groups, mounted on an aluminum SEM specimen holder by means of two-sided, adhesive-coated tape, were uniformly vacuum-coated with carbon followed by gold. The specimens were examined and photographed using a CWIKSCAN/100 field emission scanning electron microscope in the laboratories of The Evergreen State College, Olympia, Washington.

RESULTS

Figure 1 shows the breaking up of a sclereid group in dilute cuene solution. Figure 2 and Figs. 3–5 show, respectively, a still intact portion of another group and individual sclereid cells as they appear in the SEM. Comparison of the scanning electron micrographs with the transmitted light photomicrograph indicates how little dimensional shrinkage these thick-walled cells suffered in the vacuum of the SEM.

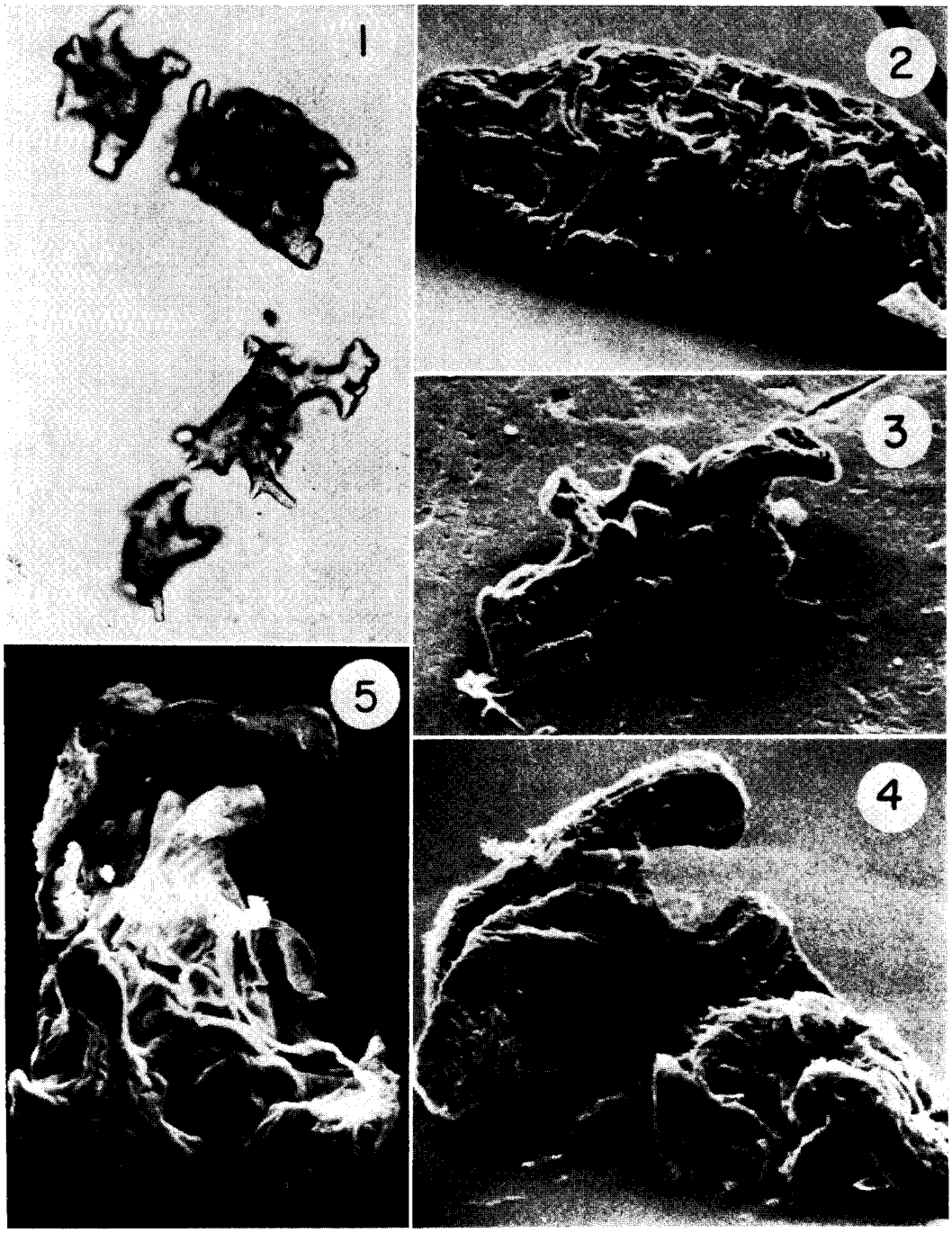

FIG. 1. Sclereid group breaking up in cuene. Transmitted light 100×. FIG. 2. Scanning electron micrograph of sclereid group. 200×. Scanning electron micrographs of individual sclereid cells: FIG. 3. 200×. FIG. 4. 400×. FIG. 5. 400×.

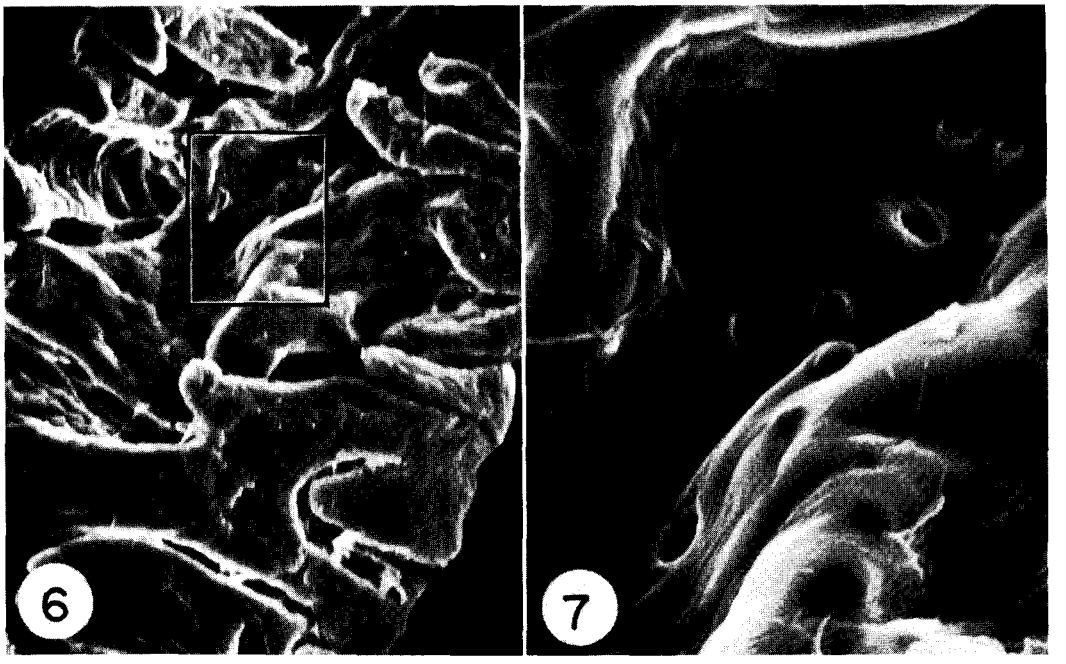

FIG. 6. Scanning electron micrograph of sclereid group shown in Fig. 2. 550 ×. FIG. 7. Detail of outlined area in Fig. 6, showing simple pits. 2000 ×.

The three-dimensional shapes of the individual cells are illustrated clearly by the scanning electron micrographs. Figures 4 and 5 show especially the voids left by interpenetration of adjacent cells. Figure 6 is a different view of the sclereid mass shown in Fig. 2. The greater magnification shows more clearly how the irregular individual cells interlock to form a group. In addition, Fig. 6 reveals the presence of simple pits. In Fig. 7, the increased magnification of the framed area of Fig. 6 reveals both open pits as well as some that appear to be blocked by some residual material.

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