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A CASSITERITE PSEUDOMORPH AFTER QUARTZ FROM TORRINGTON, NEW SOUTH WALES

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This short paper serves to record the occurrence of cassiterite pseudomorphous after crystallized quartz from the Torrington tin mining district of north-eastern New South Wales.

In Dana's System of Mineralogy, Vol. 1, p. 579 (Palache *et al.*, 1944) it is stated "The reported pseudomorphs of cassiterite after tourmaline and quartz appear to be without foundation." This contention indeed expresses the general case, for, in order to have a quartz crystal pseudomorphed by cassiterite, it is necessary that the precipitation of cassiterite follows *after* the development of vug quartz implicitly of hydrothermal origin.

Such a succession of mineralogical events contravenes general experience regarding cassiterite mineralization which is usually considered to be typically pneumatolytic.

These contrary circumstances, however, prevailed in most of the hydrothermal cassiterite veins of the Torrington district of New South Wales where epi-Permian granite has intruded a series of Permian sediments and volcanics, and in a late, relatively low temperature, hydrothermal stage of mineralization (Lawrence, 1957) has given rise to a series of shear fissure veins.

One of these fissure veins known as the Dutchman Lode consists of a wall zone of quartz, containing in places, small vugs of crystals, followed by an inner zone of sericite-chlorite-quartz-cassiterite and lastly a central filling of crustified quartz.

Pre-existing vein quartz was penetrated by a later generation of cassiterite bearing fluids. Deposition of cassiterite and the associated chlo-

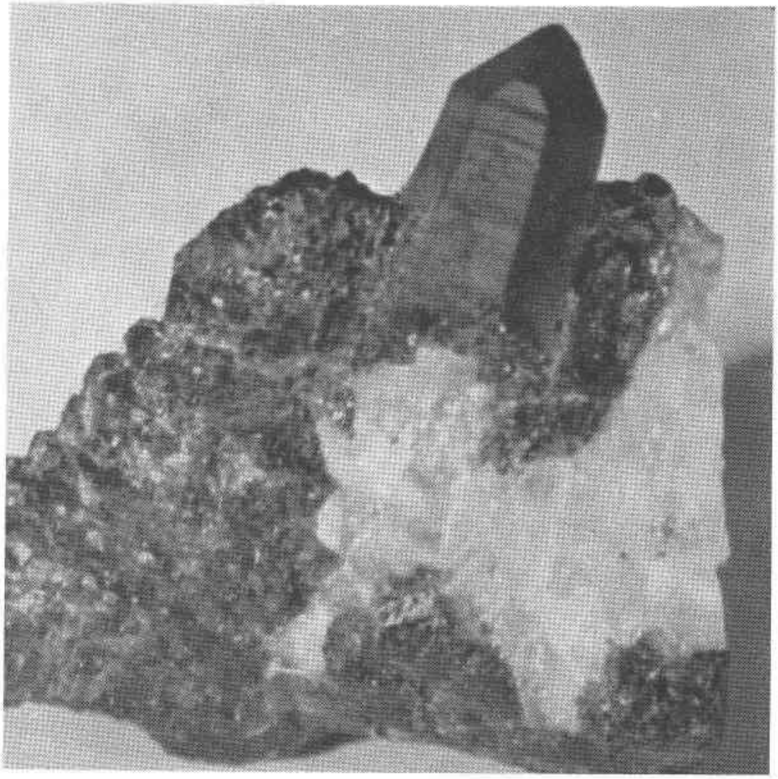

Fig. 1. Pseudomorph of cassiterite after quartz. Dutchman Lode, Torrington, N.S.W.

rite-sericite-quartz was accomplished partly by fissure filling and partly by metasomatic replacement. In the vicinity of one small vug of earlier formed quartz, cassiterite has replaced the quartz.

Figure 1 illustrates a quartz crystal about one inch long completely replaced by fine-grained cassiterite. The pseudomorph no longer possesses the highly lustrous faces characteristic of the majority of the quartz crystals from the Dutchman Lode. In most places the replacement material is an aggregate of sericite, chlorite and cassiterite. This mineral composite can be seen at the left of Fig. 1, where it appears to be replacing the earlier lode quartz.

The cassiterite pseudomorph clearly shows the characteristic striations (oscillatory combinations of [1011] and [1010]) of the original quartz crystal. X-ray diffraction measurements indicate pure cassiterite and an absence of quartz.

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A SIMPLE CENTERING JIG AND GONIOMETER FOR PUNCHING OR DRILLING SPHERES FOR STRUCTURE MODELS

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INTRODUCTION

In most crystal or molecular structure models using spheres to represent atoms,* the bond directions must be rather accurately located. Some crystal structures have atoms whose coordination polyhedra are regular. For these atoms the bond directions are easily located by punching or drilling jigs such as those described by Dore (1926), Evans (1948), Wooster (1945), and Gibb and Bassow (1957). The jigs of Wooster and of Evans allow 26 holes to be drilled along the symmetry axes of the cubic system and thus can be used to drill several different regular coordinations; however, a different jig is necessary for each size of sphere.

For irregular coordinations, more elaborate devices are necessary to position the bond directions accurately. Several drilling goniometers described by Buerger (1935), Terpstra (1939), Haywood (1949), and Decker and Asp (1955) are based on a system using spherical coordinates to locate the bond directions. These coordinates are rarely published. This paper describes a new goniometer which is versatile enough for use in drilling any irregular coordination yet requires only a knowledge of the bond angles.

GENERAL DESCRIPTION

Two devices are used in drilling the spheres in any desired coordination. The centering jig is used to drill the first hole through the center of the sphere. Then the goniometer locates a second hole related to the first by a known bond angle. For all succeeding holes, the goniometer essentially guides the drill or punch along that radius of the sphere which makes the desired angles with two previously located radii.

* A detailed review of structure model types is given in a separate article (Smith, 1960).