

placement of the diabasic sills (considered forerunners of the main ashveld intrusion) and before cooling of the main body of the Complex (Cilliers, 1964).

Cape Asbestos Field. This field is in Griqualand West, Cape Province, 700 km to the west of the asbestos mining areas of the Transvaal. It lies along a line of low hills (Asbestos Mountains, Kuruman Hills) that stretches from 40 km south of Prieska, northward past Kuruman to Pomfret near the Botswana Border, a distance of 480 km (Fig. 1). The crocidolite asbestos-bearing ironstones of this area are included within the Pretoria Series of the Transvaal Supergroup and are suggested to be correlated with the Pretoria Series rocks to the east in the Transvaal (Cilliers, 1964, p. 581). Stratigraphic correlations between the Transvaal and Cape regions are subject to somewhat different interpretation (Cilliers, 1964; Cilliers and Genis, 1964; Beukes, 1973, 1980). New nomenclature proposals by Beukes (1980) place the crocidolite-bearing banded ironstones of the Cape within the Griquatown and Kuruman Iron Formations of the Asbesheuvels Subgroup. Cilliers (1964, p. 5881) states that it may be accepted that the banded ironstones in the Cape Province and in the Transvaal were formed contemporaneously and under similar conditions. The asbestos deposits of the Cape are generally located in the monoclinial folds. Metamorphism is generally absent.

Formation of banded ironstones. The origin of the Precambrian banded ironstones of South Africa is still the subject of much debate, but it is possible to summarize some of the main ideas on their paragenesis. The deposition of the sediments probably occurred in relatively shallow water, in some places in saline basins. Iron and silica are derived from normal weathering processes. Primary precipitates such as silica and hydrous iron oxides and silicates may have been the precursors to the later-formed stilpnomelane, minnesotaite, and riebeckite. Biochemical actions of organic matter also probably had an important influence on the mineral chemistry. The change of amphibole mineralogy from amosite in the Fenge area, mixed amosite-crocidolite in the Huntjenspoort-Halips Drift area, to crocidolite in the Cape suggests that there was a gradual change of conditions of sediment formation: deposition in a predominantly fresh water environment in the Transvaal to a

predominantly saline environment in the Cape (Cilliers, 1964).

The reason why the amphiboles crystallized in an asbestiform habit rather than the typical prismatic form is a subject of some interest. It is pertinent to note the comments of Dreyer and Robinson (1978), who state (p. 3-4) "the greatest development of fibre occurs where two sets of folds intersect to form domes or basins. It is firmly believed that the development of fibre deposits could only have taken place in a favourable stress environment." For further comments on crystal growth of asbestos minerals in stress fields, see Zolnai (Chapter 5, this volume).

Crocidolite in ironstones of Western Australia

Crocidolite asbestos is also found in the banded ironstones of the Hamersley Iron Province, Western Australia (Fig. 4). These formations are remarkably similar to those of the Cape Province of South Africa and are included among the great iron formations of the world which formed under very similar conditions and during a single geologic epoch approximately 1900 to 2500 m.y. ago (James and Sims, 1973).

The banded ironstones are widely distributed in the Marra Mamba, Brockman, and Boolgeeda Iron Formations of the Hamersley Group, Mount Bruce Supergroup. The ironstones are approximately 2000 m.y. old (Trendall, 1973). Although riebeckite is widely distributed in these three iron formations, it is only abundant in fibrous form (crocidolite) in four narrow zones.

The Hamersley ironstones are thought to have formed in much the same way as those of South Africa, by precipitation of volcanically derived iron and silica in a shallow basin. Massive riebeckite developed during diagenesis from previously existing minerals, with crocidolite asbestos crystallizing later in a stress environment. The major asbestos deposits are confined to the northern limb of the broad syncline of the Hamersley Range (Trendall and Blockley, 1970). These authors propose a "stress-reversal" for asbestos growth; they state (p. 18) "Crocidolite grew later by splitting and dilatation of magnetite mesobands in banded iron formation as a relief from balanced compression from two sides in particular structural situations, where gravitational sliding opposed 'tectonic' stress."

Crocidolite mining in Western Australia began on a very small scale