

DUPORTHITE: A MIXTURE OF TALC AND CHLORITE

P. W. SCOTT AND M. R. POWER

P. W. Scott and M. R. Power, Camborne School of Mines,
University of Exeter, Redruth, Cornwall TR15 3SE



Duporthite was first described by Collins (1877b) from an altered "picrite" intrusion exposed in the cliff at Duporth, near St. Austell, Cornwall [SX 036 513]. It occurs in "fibrous masses occupying fissures and shrinkage cracks ...The fibres are placed transversely across the vein, making generally an angle with the walls of about 70°... the mineral is greenish to brownish gray, has a silky lustre, H [hardness] about 2 and Sp. Gr. 2.78...The fibres are flexible like asbestos" (Collins, 1877b). Chemical analyses were presented which differed widely from other asbestiform minerals, and hence Collins named it a new mineral. It is referred to in Clark (1993) as requiring re-examination. Samples identical to those described by Collins have been obtained from the same locality and the mineral re-appraised.

The host intrusion is an extensively faulted and altered dolerite sill (Power and Scott, 1995). Veins of duporthite are common in the more altered parts of the sill and are up to 4 cm wide. Siderite veins with a dark brown surface oxidation are also common (these veins frequently contain duporthite). X-ray diffraction patterns of several samples of duporthite, made using a Siemens D5000 X-ray diffractometer, show it to be a mixture of talc and chlorite with proportions varying between samples. Samples examined using the SEM show that the intergrowth is very fine; the two phases are unresolvable using a 4 pm electron beam (Figure 1). Weathering tends to remove chlorite preferentially, hence the more weathered veins have a whiter colour.

Chemical analyses by X-ray fluorescence spectrometry of several samples are given in Table 1, the analysis of Collins is also given for comparison. The major differences are the increased amounts of MgO and lesser amounts of Al₂O₃ in the new analyses. This confirms the comments made by Ussher *et al.* (1909), in referring to analyses of the Duporth "serpentinite" made by Collins (1877a) and Phillips (1878), that magnesia may be precipitated with alumina in gravimetric analyses unless special precautions are taken. Differences in chemical composition are due to variable chlorite contents (Al₂O₃ is proportional to the chlorite content).

ACKNOWLEDGMENTS

We gratefully acknowledge C. M. Bristow for introducing the locality to us; L. Sear for the chemical analyses; and the owners of Duporth Holiday Village who cheerfully allowed access to the exposure on their private beach.

REFERENCES

- CLARK, A. M. 1993. *Hey's mineral index: mineral species, varieties and synonyms, Third Edition*. Natural History Museum Publications, Chapman and Hall, London, 852 pp.
- COLLINS, J. H. 1877a. Note on the serpentinite of Duporth, St. Austell Bay. *Mineralogical Magazine*, **1**, 222.
- COLLINS, J. H. 1877b. Note on Duporthite, a new asbestiform mineral *Mineralogical Magazine*, **1**, 226.
- PHILLIPS, J. A. 1878. On the so-called 'Greenstones' of Central and Eastern Cornwall. *Quarterly Journal of the Geological Society of London*, **34**, 474.
- POWER, M. R. and SCOTT, P. W. 1995. Talc-carbonate alteration of some basic and ultrabasic bodies in Cornwall. *Proceedings of the Ussher Society*, **8**, 392-397.
- USSHER, W. A. E., BARROW, G., MACALISTER, D. A. AND FLETT, F. S. 1909. *Geology of the country around Bodmin and St Austell with notes on the petrology of the igneous rocks*. Memoir of the British Geological Survey of Great Britain. pp.49-51.

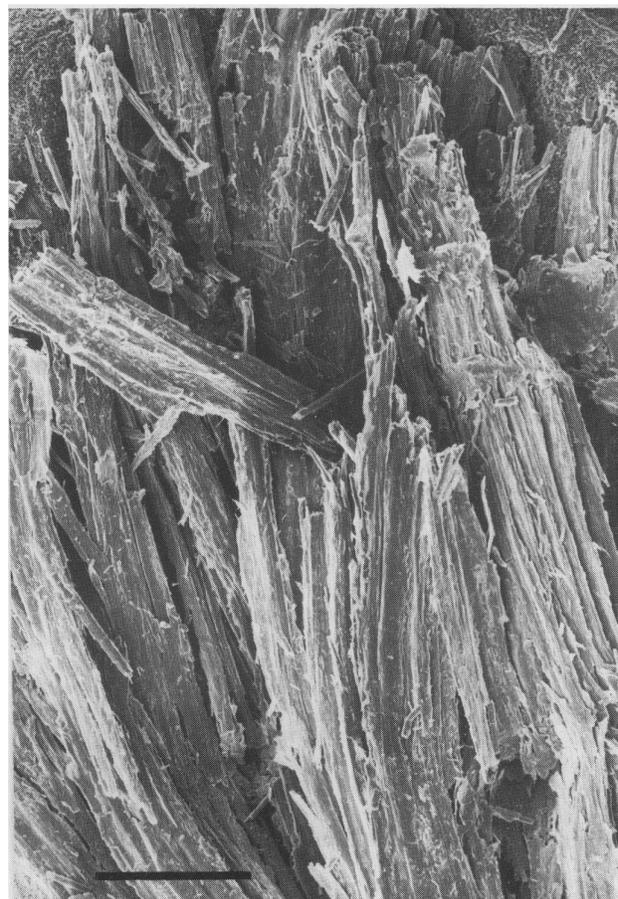


Figure 1: Scanning electron microscope image of talc and chlorite ("duporthite") showing the fibrous habit. When viewed end-on, the material appears platy (scale bar = 0.5mm).

| | Duporthite (after Collins) | | Duporthite (new analyses) | | |
|--------------------------------|-------------------------------|-------|------------------------------|-------|-------|
| | SiO ₂ | 49.21 | 35.00 | 50.62 | 53.13 |
| Al ₂ O ₃ | 27.26 | 10.90 | 4.31 | 2.03 | 1.92 |
| MgO | 11.14 | 28.00 | 26.85 | 24.29 | 25.78 |
| Fe ₂ O ₃ | 6.20 | 12.30 | 9.47 | 10.53 | 8.71 |
| TiO ₂ | - | 0.07 | 0.04 | 0.05 | 0.11 |
| CaO | 0.39 | 0.04 | 0.03 | 0.02 | 0.15 |
| Na ₂ O | 0.49 | 0.40 | 0.28 | 0.50 | 0.13 |
| K ₂ O | - | 0.01 | 0.01 | 0.01 | 0.01 |
| L.O.I. | *4.58 | 12.10 | 7.63 | 8.65 | 5.63 |
| Total | 99.27 | 98.82 | 99.24 | 99.21 | 99.21 |

Table 1: Chemical Analyses of Duporthite. Values in weight percent. L.O.I. = loss on ignition. * = H₂O + hygroscopic water.