ment of Mines (1970), there is too little Pb in Petterd's original analysis to explain the discrepancy by the assumption that the analysed material was simply a mixture of mimetite and crocoite. Furthermore, the two specimens examined in this investigation contain substantial amounts of 'bellite', but no recognizable crocoite, so contamination by the latter is unlikely.

Whatever the explanation for Petterd's analytical results, the name 'bellite' should remain discredited as a species name. It is unfortunate that this name, long fallen into disuse, was used by Cesbron and Williams (1980) with reference to a synthetic product.

Acknowledgements. The authors would like to thank Mr. Noel R. Kemp, Curator of Geology, Tasmanian Museum and Art Gallery, for making the specimens of bellite from the Petterd Collection available for study.

References

Cesbron, F. and Williams, S. A. (1980) *Bull. Mineral.*, **103**, 469–77.

Palache, C., Berman, H., and Frondel, C. (1951) *The System of Mineralogy*, 7th ed., Vol. II, p. 895.

Petterd, W. F. (1905) *Report of the Secretary of Mines, Tasmania* for 1904, p. 83.

Tasmania Department of Mines (1970) *Catalogue of the Minerals of Tasmania* (revised and amended 1969). Geological Survey Record No. 9, 110 pp.

[*Manuscript received 3 November 1992*]

KEYWORDS: bellite, mimetite, Magnet mine, Tasmania.

Division of Mineral Products, CSIRO, Wembley, W.A. 6014, Australia E. H. NICKEL

Division of Exploration Geoscience, CSIRO, Wembley, W.A. 6014, Australia G. J. HITCHEN

MINERALOGICAL MAGAZINE, SEPTEMBER 1993, VOL 57, PP. 540–542

Stellerite from Todhead Point, Grampian Region, Scotland

STELLERITE is a zeolite (named by Morozewicz in 1909) which has the same aluminosilicate framework as stilbite, the first mineral described as a zeolite by Cronstedt (1756) and later named by Haüy (1801). The two minerals differ in their alkali metal and alkaline earth contents. Stilbite has the unit cell formula $NaCa_4(Al_9Si_{27}O_{72}).30\ H_2O$ whilst that of stellerite contains only calcium, i.e. $Ca_4(Al_8Si_{28}0_{72}).28\ H_2O$ (Gottardi and Galli, 1985).

The earliest detailed compilation of zeolite locations in Scotland was that of Heddle (1901) and it contains analyses of two stilbite samples from Todhead Point (Grid Ref. No. 870769) which is on the east coast of Scotland approximately 9 km due south of Stonehaven (Grampian Region). Todhead Point is formed from igneous and sedimentary rocks of Old Red Sandstone (Devonian) age and the zeolites occur in an olivine basalt (Patterson, pers. comm.) as brick red lamellae, up to 1 cm, in amygdales. The basalt crops out immediately below the Todhead lighthouse and also in the adjacent Braidon Bay, north of the lighthouse. When samples collected from Todhead, and thought to be stilbite, were subjected to routine differential thermogravimetric analysis (DTG), using a Mettler TA 3000 instrument, an unusual thermal profile was noted (Fig. 1). Complimentary X-ray powder diffractometry (Philips APD 1700) suggested that the sample contained stellerite and some mordenite. Scanning electron microscopy (Philips 515) confirmed the presence of two distinct crystal morphologies, one stumpy, and one prismatic. The prismatic crystals were virtually sodium free with calcium being the predominant cation present. (EDAX analysis using a Philips 9100 instrument Fig. 2*a*).

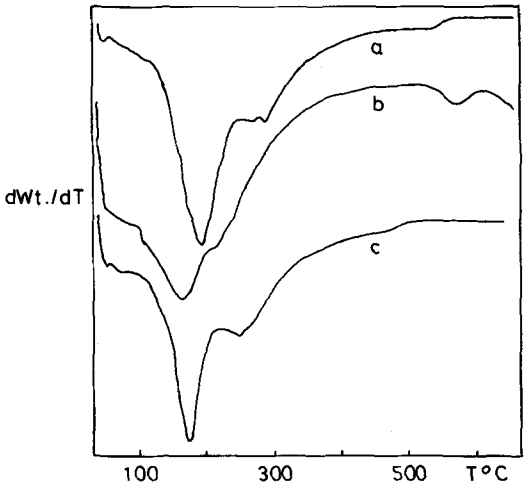

FIG. 1. Differential thermograms for: (*a*) stellerite, Jambar Springs, New South Wales, Australia; (*b*) Todhead sample; (*c*) stilbite, Leac Nan Fionn, Isle of Skye (Grid ref. NE 464712).

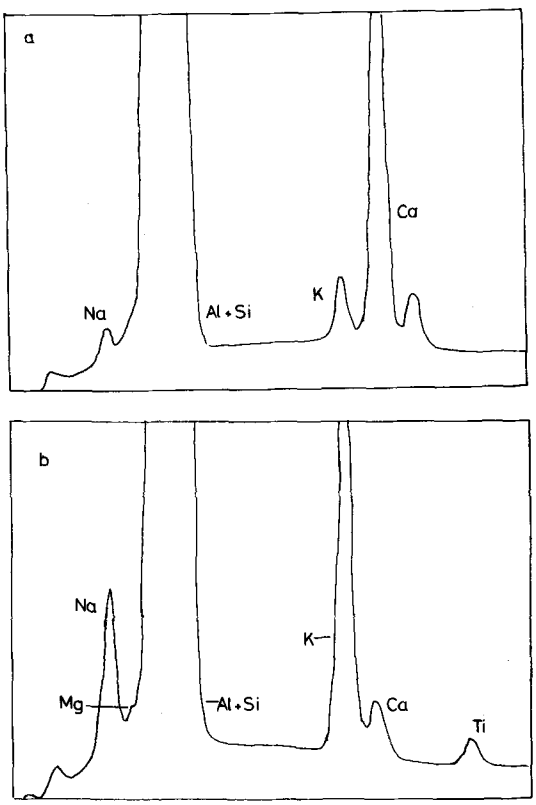

FIG. 2. EDAX analysis of morphologies (*a*) prismatic, (*b*) stumpy. Identified by SEM in sample having the thermal profile (*b*) in Fig. 1.

This calcium phase is thus confirmed as stellerite and constitutes the first record of this mineral in Scotland, although it must be pointed out that Heddle (1901) also quoted a 'stilbite' containing only calcium cations from a location cited as 'Dumbarton'. The crystals, with stumpy morphology (EDAX analysis in Fig. 2*b*), were much less prevalent and were probably mordenite, as conjectured from the presence of mordenite reflections in the XRD analysis, and the likelihood that the unusual DTG profile was caused by the presence of the main water loss feature of mordenite which occurs as a broad peak at about 200 °C (Gottardi and Galli, 1985). Other samples collected from this location have proved to be pure mordenite, which is a new site for this comparatively rare mineral. Heddle (1901) also records laumontite at Todhead, which we can confirm, but not his noting of heulandite. Zeolites, of course, are metastable minerals and their persistence from Devonian time is unique without the invocation of a more recent hydrothermal or diagenetic event which, so far as we have been able to ascertain, has not been envisaged at this location. Stellerite is a particularly unusual occurrence and a comprehensive, worldwide, literature search has failed to find any record of stellerite, or stilbite, in rocks older than the Tertiary period.

Acknowledgements. Our thanks are due to Mr. B. Bucknall for experimental assistance, and to Mr. Paul Fredrickson, Department of Minerals and Energy, N.S.W. Government, Australia, for the supply of the stellerite sample.

References

Cronstedt, A. F. (1756) Kongl Vetenskaps Acad. Handl. Stockholm, **17**: 120–3.

Gottardi, G. and Galli, E. (1985) *Natural Zeolites*. Springer Verlag, Berlin and Heidelberg.

Haüy, R. J. (1801) *Traité de mineralogie*, Ches Louis Paris, Vol. **3**, p. 180.

Heddle, M. F. (1901) In: *The Mineralogy of Scotland* (T. G. Goodchild, ed.), David Douglas, Edinburgh, 2 Vols., Vol. **2**, pp. 88–91.

Morozewicz, J. (1909) *Bull. Acad. Sci. Cracoviae Cl. Sci. Mat. Nat.*, p. 344.

[*Manuscript received 25 September 1992: revised 26 November 1992*]

KEYWORDS: stellerite, stillbite, Scotland, zeolite.

Department of Chemistry and Applied Chemistry, University of Salford, Salford M5 4WT

A. DYER, O. M. WILSON AND H. ENAMY

School of Applied Sciences, University of Wolverhampton, Wulfruna St., Wolverhampton WV1 1SB

C. D. WILLIAMS