SODA METASOMATISM IN THE FERRUGINOUS QUARTZITES OF THE BABABUDAN HILLS, MYSORE STATE

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The presence of amphiboles like bababudanite and cummingtonite in the banded ferruginous quartzites of the Bababudan Hills has long been known. The ferruginous quartzites were considered in earlier years, to have been formed by the alterations of rocks containing such amphiboles (W. F. Smeeth, 1908, p. 213; P. Sampat Iyengar, 1908, p. 73).

It was shown, however, in 1933, that the occurrence of bababudanite was confined to narrow zones in the immediate vicinity of igneous intrusives (C. S. Pichamuthu and M. R. Srinivasa Rao, 1933, pp. 276–77). The mineral was quite fresh and often developed right across the bands in the ferruginous quartzites, which indicated that it was formed after the ironstones had attained their banded nature.

Intercalated with the ferruginous quartzites, there occur layers of bababudanite-magnetite schists which are often only an inch or two in thickness, and impersistent. Glistening crystals of the amphibole are found in a matrix composed of magnetite and granoblastic quartz. These schists were also considered to have had a similar contact metamorphic origin (C. S. Pichamuthu, 1935 *a*, p. 608).

During the course of the writer's examination of the Bababudans, a yellowish or brownish green pyroxene was also found sometimes in these contact zones (C. S. Pichamuthu, 1935 *b*, pp. 21–22). The chemical and optical properties of this mineral indicate that it is a soda-bearing pyroxene similar to ægirine.

Table I gives the chemical composition of these soda-bearing minerals and schist. It will be seen from this that bababudanite contains 8·8 per cent. of Na_2O, the soda-pyroxene 9·7 per cent., and the bababudanite-magnetite schist 2·6 per cent. The basic rocks adjoining and underlying the banded ferruginous quartzites of the Bababudan Hills are many of them rich in soda, as may be seen from the prevalence of albite and acid oligoclase, and the writer was therefore disposed to ascribe the source of soda to the sediments being derived from these spilitic rocks, the formation of the soda-bearing minerals being facilitated by the contact metamorphic action of the igneous intrusions (C. S. Pichamuthu, 1936, pp. 43–44).

TABLE I

	Bababudanite	Soda-pyroxene	Bababudanite-magnetite schist
SiO_2 ..	49·80	52·75	44·15
Al_2O_3 ..	1·56	0·35	0·25
Fe_2O_3 ..	18·62	33·00	40·20
FeO ..	10·59	1·42	7·98
MgO ..	9·30	0·24	3·11
CaO ..	0·45	0·80	tr
Na_2O ..	8·80	9·70	2·60
K_2O ..	tr	tr	tr
H_2O^+ ..	0·65	1·00	0·05
H_2O^- ..		0·50	1·60
TiO_2 ..	..	..	tr
P_2O_5 ..	..	tr	tr
Total ..	99·77	99·76	99·94

Bababudanite .. .. Kemmangandi, Bababudan Hills, Mysore.
Analyst: W. H. Herdsman, Glasgow.

Soda-pyroxene .. .. Kalhatti, Bababudan Hills, Mysore.
Analyst: W. H. Herdsman.

Bababudanite-magnetite schist .. Bababudan Hills, Mysore.
Analyst: W. H. Herdsman.

Similar explanations have been given for the development of soda-amphibles in the ferruginous quartzites of South Africa (P. A. Wagner, 1928, p. 72; A. L. Hall, 1925, p. 135). The crocidolite found in those banded ironstones contains soda varying from 3·9 per cent. to 7·71 per cent. Both Peacock (1928, pp. 271–72) and Hall (1930, p. 252) considered the soda to be original and dependent upon special conditions of deposition resulting in soda-rich bands in the ironstones.

According to this explanation, the necessary soda must be disseminated throughout the banded ferruginous quartzites or concentrated in certain layers, but it is difficult to understand such distribution and the form in which soda would be present in these rocks. In order to determine whether the banded ferruginous quartzites of the Bababudans contained soda, the writer recently got two typical specimens of these rocks analysed by Mr. B. S. Raju, Chemist of the Mysore Geological Department. One of these was a hæmatite quartzite from Virupakshikan, and the other a magnetite quartzite from near Hebbe. Both these specimens contained no trace of soda. The iron ores derived from the ferruginous quartzites near Kalhatti also do not contain any soda.

Sills and dykes of albite quartz dolerite (now epidioritised) have invaded the Bababudan formations, and the soda-bearing minerals have developed in the banded ferruginous quartzites only in the immediate vicinity of these

igneous intrusives. The residual solutions expelled from this basic rock must have been sufficiently sodic to bring about the formation of these amphiboles and pyroxenes in the neighbouring ironstones. This area, therefore, affords a good example of the metasomatic transference of soda from a basic igneous to a sedimentary rock.

REFERENCES

Hall, A. L. .. "On the Metamorphism of the Lower Witwatersrand System in the Vredefort Mountain Land," *Trans. Geol. Soc. S. Africa*, 1925, **28.**

——— "Asbestos in the Union of South Africa," *Mem. Geol. Surv. of S. Africa*, 1930, **12.**

Peacock, M. A. .. "The Nature and Origin of the Amphibole Asbestos of South Africa," *Amer. Miner.*, 1928, **13.**

Pichamuthu, C. S., and Srinivasa Rao, M. R. "Amphiboles in the Bababudan iron ore rocks," *Curr. Sci.*, 1933, **1.**

Pichamuthu, C. S. .. "The banded ferruginous quartzites of the Bababudan Hills, Mysore State," *Curr. Sci.*, 1935 *a*, **3.**

——— .. "The iron formations and associated rocks of the Eastern Bababudans, Kadur District, Mysore," *Half-Yearly Journ. Mys. Univ.*, 1935 *b*, **8.**

——— .. "On Bababudanite, a soda-amphibole from the banded ferruginous quartzites of Mysore, India," *Geol. Mag.*, 1936, **73.**

Sampat Iyengar, P. .. "Report on the Geology of Parts of Hassan and Kadur Districts", *Recs. Mys. Geol. Dept.*, 1908, **9.**

Smeeth, W. F. .. "General Report on the Work of the Department," *Rec. Mys. Geol. Dept.*, 1908, **9.**

Wagner, P. A. .. "The Iron deposits of the Union of South Africa," *Mem. Geol. Surv. S. Africa*, 1928, **26.**