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- [Manuscript received 16 February 1978]
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MINERALOGICAL MAGAZINE, JUNE 1978, VOL. 42, P. 280

Pargasite from the Eastern Ghats, Andhra Pradesh, India

A. T. RAO

Department of Geology, Andhra University, Waltair 530003, India

HORNBLENDES are not common in the charnockites of Kondapalli, but occur as an important constituent in the pyroxene granulites and pyroxenites of Seshadripuram hill. Analyses and optical data for two pargasites are given. (Miniprint section, p. M31.)

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Allanite from the Kondapalli charnockites, Krishna District, Andhra Pradesh, India

A. T. RAO

Department of Geology, Andhra University, Waltair 530003, India

THE coarse-grained charnockites of Donabanda hill, Kondapalli, contain metamict allanite. An analysis is given, also optical data for the heated allanite, and the conditions of formation of the rocks are shortly discussed. (Miniprint section, p. M31.)

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PARGASITE FROM THE EASTERN GHATS,

ANDHRA PRADESH, INDIA

A. T. Rao

Department of Geology, Andhra University, Waltair 530003, India

The charnockitic rocks of Seshadripuram hill, 10 km north of Kondapalli in the Eastern Ghats of India contain pargasites. The hills around Kondapalli ($16^{\circ} 37'N$ and $80^{\circ} 52'E$) in Andhra Pradesh are mainly made of hypersthene granitic stocks (acid charnockites), sills and dykes of pyroxene granulites (basic charnockites) and pyroxenites (ultrabasic charnockites) in stratigraphical sequence. These are intrusive into the basement complex represented by quartz-feldspar-biotite - garnet - sillimanite gneisses (khondalites). Hornblendes are not common but occur as an important constituent in the pyroxene granulites and pyroxenites and are probably in equilibrium with the associated coexisting pyroxenes (Leelanandam, 1970). Amphiboles from pyroxene granulites and augite-rich bronzite ($\pm$ spinel) pyroxenites in the Eastern Ghats are usually green with a little brown and have $2V_{\alpha} : 78^{\circ}-86^{\circ}$. Less brownish hornblende, or even yellow to yellowish green pleochroism, with $2V_{\alpha} 69^{\circ}-75^{\circ}$ is common in spinel-bearing bronzite (Bm70-80) pyroxenites. Such hornblendes are pargasitic.

The interstitial arrangement of pargasite between pyroxenes and sometimes growing in them enclosing the pyroxenes in a poikilitic way, suggests igneous crystallisation subsequent to pyroxene growth and earlier than the iron ore minerals.

Table I. Properties of pargasites

	1	2		Ions per $24(O,OH,F,Cl)$
SiO_2	42.11	41.45	Si	5.994
TiO_2	1.08	1.13	Al	2.006
Al_2O_3	16.45	15.96	Al	0.787
Fe_2O_3	2.90	3.29	Fe ³⁺	0.310
FeO	4.25	6.05	Fe ²⁺	0.517
MnO	0.16	0.20	Mn	0.017
MgO	17.15	15.51	Ti	0.120
CaO	11.05	11.76	Mg	3.698
Na_2O	2.40	2.49	Ca	1.697
K_2O	0.67	0.75	Na	0.672
F	1.11	0.91	K	0.120
C	0.12	0.23	OH	1.104
H_2O^+	1.15	0.90	F	0.500
H_2O^-	0.04	0.02	Cl	0.018
$O \equiv F, Cl$	0.49	0.45	Z	8.00
Total	100.15	100.22	Y	5.45
			X	2.49
				2.59

	1	2
$2V_{\alpha}$	$70^{\circ}-72^{\circ}$	$75^{\circ}-75^{\circ}$
$\chi_{\alpha} Z$	$21^{\circ}-25^{\circ}$	$20^{\circ}-25^{\circ}$
α	1.64	1.645
β	1.65	1.660
γ	1.66	1.670
α	Pale yellow	Pale yellow
β	Dark yellow	Dark yellow
γ	Pale greenish yellow	Greenish yellow
Sp.Gr.	3.15	3.17
Cell parameters		
a	9.84Å	9.89
b	18.06Å	18.17
c	5.25Å	5.30
β	$105^{\circ} 4'$	$105^{\circ} 5'$

1. Pargasite, spinel-pargasite-bronzite (Fe_{20}) pyroxenite sill, Seshadripuram hill range 10 km N. of Kondapalli.
2. Pargasite, spinel-pargasite-bronzite (Fe_{20}) dyke, Seshadripuram hill range 11 km NNE of Kondapalli.

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[Received 20 December 1977]

ALLANITE FROM THE KONDAPALLI CHARNOKITES,

KRISHNA DISTRICT, ANDHRA PRADESH, INDIA

A. T. Rao

Department of Geology, Andhra University, Waltair 530003, India

The hill range of Kondapalli ($16^{\circ} 37' N$ and $80^{\circ} 52'E$) is mainly made of charnockites with lesser pyroxene granulites, granites, khondalites, pyroxenites and dolerites in diminishing abundance. The khondalites form the basement gneisses and are intruded by the charnockites which are themselves earlier than the pyroxene granulites and pyroxenites. The charnockites (hypersthene granites, enderbites and granodiorites) are medium to coarse grained and characterised by the presence of ferrohypersthene (Fe_{50-55}), plagioclase (Ab_{60}), orthoclase perthite ($Or_{80} Ab_{20}$) and grey to bluish quartz. The coarse grained charnockites exposed on Donabanda hill are often gneissic and have in addition iron (19-24% total FeO) and Ti-rich (4-9% TiO_2) biotite, garnet and occasional metamict allanite unlike the medium grained charnockites. The heated allanite has $\alpha : 1.755$, light brown; $\beta : 1.782$, brownish yellow; $\gamma : 1.786$, greenish brown; $2V_{\alpha} : 80$ to 85 ; Sp.gr. = 3.92. The radioactivity of the allanites is 400 ± 10 c.g.m. The chemical analysis of the Donabanda hill allanite is thus with the ions to 13 (0.0H) in parentheses SiO_2 31.06 (3.02), TiO_2 1.82 (0.154), Al_2O_3 12.21 (1.401), Fe_2O_3 6.12 (0.344), FeO 10.06 (0.514), MgO 0.99 (0.044), MnO 0.20 (0.017), CaO 9.12 (0.251), Sc_2O_3 0.05 (0.009), Ca_2O 16.10 (0.572), La_2O_3 6.29 (0.225), Nd_2O_3 3.12 (0.109), Y_2O_3 0.20 (0.007), ZrO_2 0.14 (0.006), ThO_2 0.48 (0.010), U_2O_5 0.01 (0.002), V_2O_5 0.10 (0.008), PbO 0.04 (0.001), H_2O^+ 1.76 (1.142), H_2O^- 0.04, total 99.90.

The coexisting pyroxenes from the Kondapalli and the Madras charnockites approached chemical equilibrium above $600^{\circ} C$. (Leelanandam, 1967). $750^{\circ} C$. is reported from the charnockite rocks of Visakhapatnam district, Andhra Pradesh (Srinivasdas et al. 1969). At such temperatures palingenesis could play an important role depending on the water pressure. The medium grained igneous charnockites (granitic to enderbite composition) grading into coarse grained charnockites and pegmatites (granodioritic composition) rich in K-feldspar, biotite with or without allanite, apatite and garnet suggest palingenesis. The radioactivity, 2.25 ± 0.05 c.g.m. in the igneous charnockites increases to 8.85 ± 0.05 c.g.m. in the palingenetic charnockites of this region. The marked concentration of K and associated elements Ti, Ba, Rb, Sr, Zr, Ce, Th, U, P in the liquid phase, which is likely to occur during the partial melting of charnockites, could effect an enrichment of radioactive minerals even if the allanite crystallised as a late fraction below $600^{\circ} C$.

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[Received 20 December 1977]