

## Apatite veins from charnockite pegmatites of Visakhapatnam District, Andhra Pradesh

A. T. RAO, K. V. S. ACHARYULU AND K. SANYASI RAO

Pale yellowish apatite occurs as widespread granular crystals (0.5 to 4 mm in diameter) in the charnockite pegmatites cutting across the hypersthene granitic rocks of tonalitic composition in Air Port hill, Visakhapatnam and Narasipatnam hill ranges (Long : 82°30'E and Lat : 17°30'N) in Andhra Pradesh (Fig. 1). The charnockite pegmatites, are of paligenetic origin and occasionally contain allanite. Although apatite is a ubiquitous accessory mineral in charnockite rocks, much attention has not been paid to its study due to the difficulty in obtaining pure mineral fraction of apatite. Its dominating occurrence as coarse grains in the form of thin veins in the charnockite pegmatites of Visakhapatnam and Narsipatnam has provided an opportunity to obtain pure apatite and carrying out mineralogical studies. The refractive index,  $N_o = 1.641$ , indicates the apatites to be fluorine rich. The chemical analyses (Table I) indicate the samples under study to be fluor-apatites. The X-ray diffractograms and the calculated lattice constants  $a \text{ \AA} 9.40$ ,  $c \text{ \AA} 6.87$ ,  $c/a 0.731$ ,  $V \text{ \AA}^3 526$  are characteristic of fluor-apatites.

The charnockite pegmatites are of granodioritic composition and are made of plagioclase ( $An_{40}$ ), orthoclase perthite ( $Or_{80}Ab_{15}An_5$ ), almandine and pyrope rich garnet, iron rich biotite (>20% total iron), hypersthene ( $En_{44}$ ), quartz, apatite and

TABLE I. Chemical analyses of fluor-apatites from  
charnockite pegmatites, Visakhapatnam district,  
Andhra Pradesh

Oxides	Wt. %		Number of ions on the basis of (26 O, OH, F)		
	1	2	1	2	
CaO	55.02	54.59	P	5.956	5.958
P <sub>2</sub> O <sub>5</sub>	42.01	41.98	Ca	9.892	9.824
Fe <sub>2</sub> O <sub>3</sub>	0.35	0.20	Fe <sup>3+</sup>	0.044	0.025
TiO <sub>2</sub>	0.06	0.05	Ti	0.008	0.006
			Mn	0.028	0.024
MnO	0.20	0.17	Σ	9.972	9.879
F	3.75	3.64	F	1.986	1.930
Cl	0.10	0.35	Cl	0.003	0.099
H <sub>2</sub> O <sup>+</sup>	0.20	0.25	OH	0.112	0.279
H <sub>2</sub> O <sup>-</sup>	0.05	0.04	Σ	2.101	2.308
	101.74	101.27	1. Apatite from Visakhapatnam		
O≡F, Cl	1.59	1.61	2. Apatite from Narasipatnam		
<b>Total</b>	<b>100.15</b>	<b>99.66</b>			



Figure 1. Charnockite pegmatites in hypersthene granitic rock.

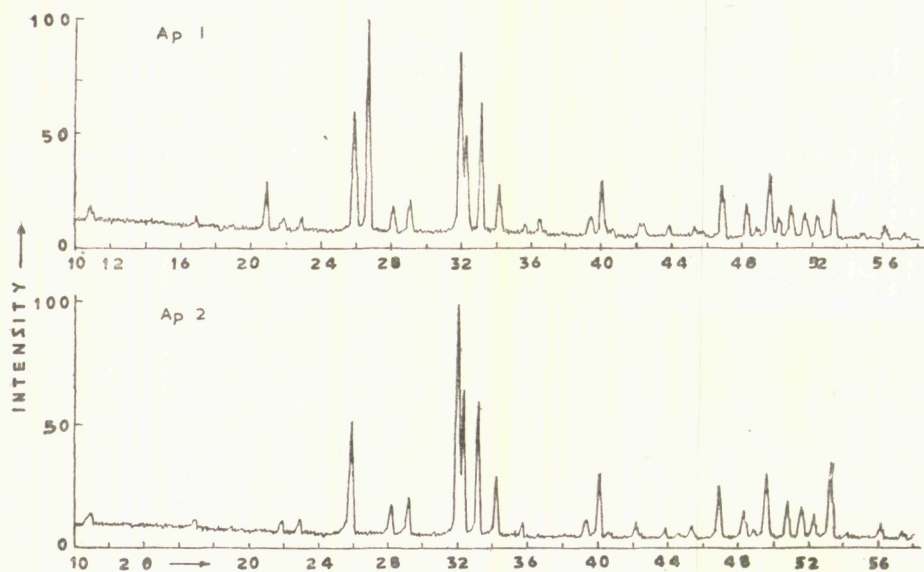


Figure 2. X-ray diffractograms of chemically analysed apatites (1 & 2) from charnockite pegmatites.

ore minerals (magnetite and ferrian ilmenite). Apatite replaces the mineral assemblage—feldspars, garnet and biotite and is further enclosed and replaced by ore minerals. The fluor-apatite formed after biotite and earlier to ore minerals in the paragenetic sequence of charnockite pegmatite mineral assemblage in the Eastern Ghats suggests a temperature of formation in the range 550–600°C.

*Address of the Authors*

A. T. RAO, K. V. S. ACHARYULU and K. SANYASI RAO, Department of Geology, Andhra University, Waltair.

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