

range of 800–950° C, the conversion to haematite, magnesioferrite, olivine, aegirine and vapour takes place. Above this pressure, magnesioriebeckite melts incongruently. Similarly, riebeckite breaks down around 750° C and below 1,500 atm. water vapour pressure to aegirine, fayalite, magnetite, quartz and vapour. The coexistence of magnesioriebeckite and aegirine can be explained on these lines; the vapour pressure built up in such a case may be due to the partial pressure of oxygen in the oxide facies rocks and carbon dioxide in carbonate facies rocks⁹. The formation of magnesioriebeckite, in turn, may be explained by the concept of Cilliers and Genis¹⁰; accordingly riebeckite is formed by lithification and diagenesis or under greenschist facies metamorphism of attapulgitic-rich clay admixtures containing precipitates of iron and silica along with alkali solutions.

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AN OCCURRENCE OF GADOLINITE NEAR KARATTUPPATTI, MADURAI DISTRICT, TAMIL NADU

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ABSTRACT

Chemical and spectrographic analyses of a greenish-black radioactive mineral from a zoned pegmatite near Karattuppatti showed 51.84% $\text{Ce}_2\text{O}_3 + \text{La}_2\text{O}_3 + \text{Y}_2\text{O}_3$, 9.0% BeO , 0.54% U_3O_8 , 15.7% $\text{Fe}_2\text{O}_3 + \text{FeO}$, 22.04% SiO_2 , and minor amounts of Er, Gd, Yb, Dy, Ho, Lu, Tm, B, Cr, Mg, Mn, and Zr. X-ray diffractometry confirmed it to be gadolinite—the second of its type to be reported from India. The presence of cerium as a major element in the mineral establishes it to be the variety cergadolinite.

INTRODUCTION

AN *in situ* boulder weighing about 15 kg and consisting of two distinct minerals—a golden yellow beryl and a dark greenish-black mineral—was located in a zoned pegmatite about a km southwest of Karattuppatti village (10° 03'–77° 55') (Survey of India Toposheet No. 58 F/16) in Tirumangalam Taluk, Madurai District. X-ray diffractometric, chemical and spectrographic analyses of the greenish-black mineral have established it to be gadolinite—an uncommon rare-earth mineral ($\text{Be}_2\text{FeY}_2\text{Si}_2\text{O}_{10}$), the occurrence of which has not been recorded since Holland's report¹ on gadolinite from Hosainpura (Banaskanta District, Gujarat). This paper presents a description of the geological setting, mineralogical and geochemical features of the Karattuppatti gadolinite occurrence.

GEOLOGICAL SETTING

The area around Karattuppatti (Fig. 1) exposes Precambrian migmatitic gneiss composed of garnet, biotite, hornblende, magnetite, feldspar and quartz in varying proportions. This gneiss is flanked on the north by highly feldspathic garnetiferous

gneiss, and in the south by quartzite interbanded with the migmatitic gneiss. Distinct bands of calc- and pyroxene-granulite, too small to be represented separately on the map, occur interbanded with the gneissic rocks. Zoned discordant pegmatites carrying rare-earth minerals and beryl are confined to the gneissic rocks and are absent in the quartzite. Foliation in the rock formations trends about east-west with sub-vertical to steep southerly dips, generally conforming to the broad regional trends of the formations.

MINERALOGICAL ASPECTS

The gadolinite-bearing pegmatite has a central zone of perthite surrounded by a perthite-quartz-plagioclase zone and a peripheral zone of quartz-feldspar-muscovite pegmatite (Fig. 1). Assemblages of radioactive rare-earth minerals consisting of allanite, polycrase and gadolinite, as also golden yellow, blue and green beryl, tourmaline and muscovite are associated with the two outer pegmatite zones. The rare-earth minerals and beryl occur as disseminations, small segregations and pods in the pegmatite, and appear as float in the debris around often ranging upto 15 cm in length,

In hand specimen, the gadolinite is greenish-black and opaque, and in thin sections, is bottle green. It is radioactive and has a conchoidal fracture from India. With the increasing use of rare-earths and beryllium in the television, electronic and aerospace industries, and in nuclear reactors, it

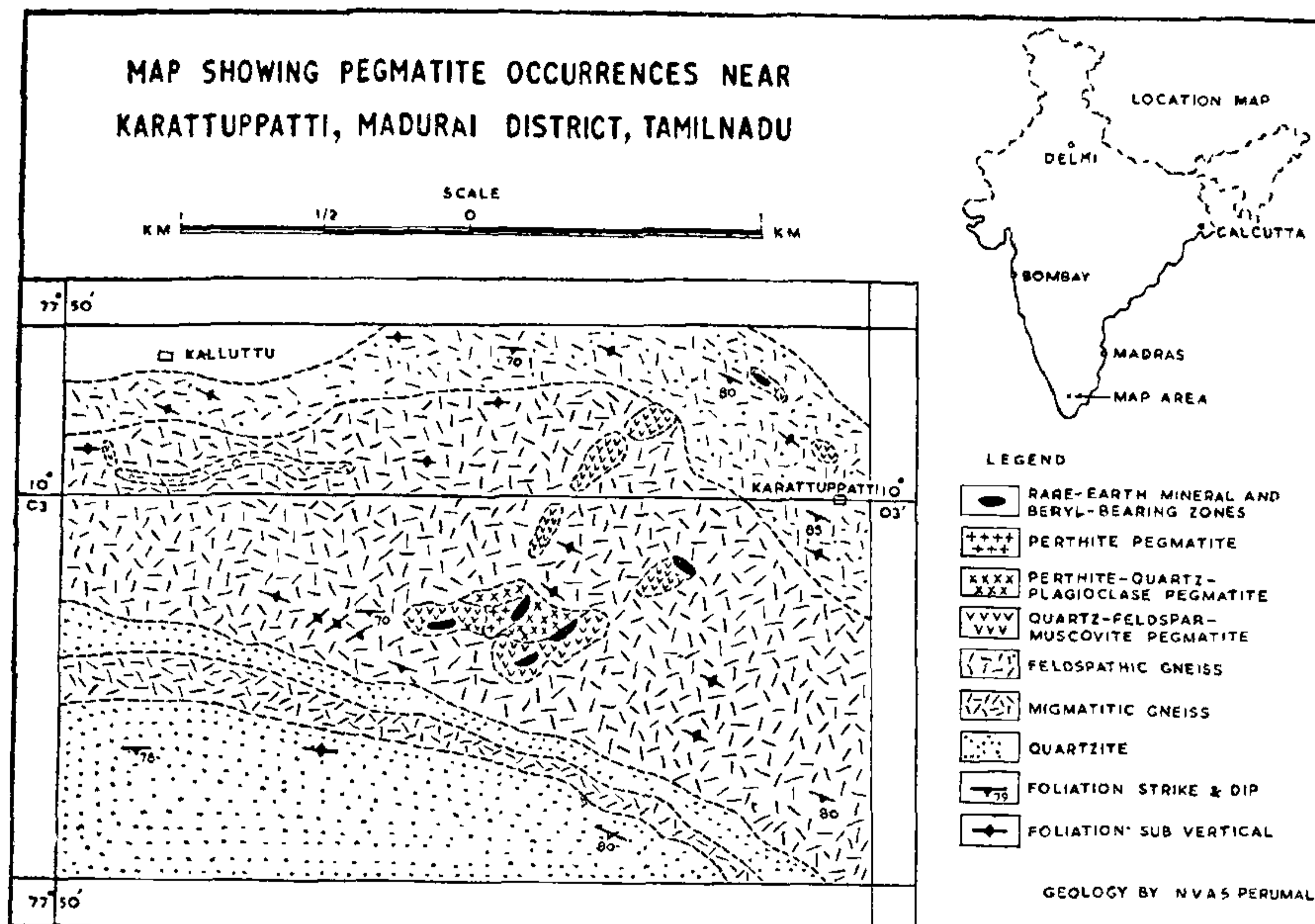


FIG. 1

fracture, vitreous lustre, hardness of 7, and a Specific Gravity of 4.167.

GEOCHEMICAL FEATURES

The mineral has 51.84% of combined cerium, lanthanum and yttrium earths, 22.04% SiO_2 , 15.7% of total iron oxides, and 9.0% BeO . These data compare very well with the theoretical composition of gadolinite²—($\text{Y}_2\text{FeBe}_2\text{Si}_2\text{O}_{10}$)—(55.40% rare-earths, 22.20% SiO_2 , 13.2% FeO and 9.2% BeO) and also with the compositions of gadolinites reported from the U.S.A., U.S.S.R., and Sweden (Table I). The presence of 0.54% U_3O_8 in the Karattuppatti gadolinite sample is responsible for its observed metamictization. Spectrographic analysis revealed also the presence of Er, Gd, Yb, Dy, Ho, Lu, Tm, B, Cr, Mg, Mn, and Zr in the sample.

CONCLUSION

The presence of cerium as a major element in the Karattuppatti gadolinite establishes it to be the variety cergadolinite. The occurrence described here is only the second of its kind to be reported

TABLE I
Chemical analyses (%)

	1	2	3	4
Ce_2O_3	51.84	32.33	15.44	6.52
$\Sigma \text{La}_2\text{O}_3$		22.24	36.92	39.27
$\Sigma \text{Y}_2\text{O}_3$		22.24	36.92	39.27
U_3O_8	0.54	0.89	..	..
ThO_2	..	0.46	..	..
SiO_2	22.04	22.13	24.84	25.16
Fe_2O_3	15.7	1.13	..	2.15
FeO		10.43	9.67	12.40
BeO	9.0	7.19	8.82	9.37
Al_2O_3	..	2.34	1.27	..
$(\text{Zr}, \text{Ti})\text{O}_2$	..	..	1.58	..
CaO	..	0.34	..	1.11
MgO	..	0.14	..	..
Na_2O}	..	..	0.64	..
B_2O_3	..	0.86	..	2.32
H_2O}	..	..	0.74	1.28

- Gadolinite from Karattuppatti, Madurai District, India.
- Cergadolinite from Colorado, U.S.A.³.
- Cergadolinite from Tuva, U.S.S.R.².
- Gadolinite from Ytterby, Sweden.².

would be worthwhile to systematically investigate the rare mineral potential of small as well as large complex pegmatites of India.

ACKNOWLEDGEMENTS

The author is grateful to Mr. K. K. Dar, Director, Atomic Minerals Division, for kind encouragement. Thanks are due to Dr. A. V. Sankaran for encouragement and spectrographic analysis, Mr. N. Nagaraja Rao for X-ray confirmation, and Messrs. B. N.

Tikoo and M. D. Shirgaonkar for chemical analysis. Thanks are also due to Dr. S. Viswanathan for helpful suggestions.

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HETEROSIS IN CHROMOSOME BEHAVIOUR OF EGG-PLANT

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ABSTRACT

Chiasma frequency in 6 varieties of egg-plant (*Solanum melongena* L.) and their 10 hybrids, 5 highest yielding and 5 lowest yielding, out of possible 30 has been studied. Varieties and hybrids differed from each other with regard to mean chiasma frequency. The chiasma frequency is reported to be genetic and probably under the control of polygenes. Four hybrids showed heterosis in chiasma frequency over their better parent, the maximum being 30.8%.

INTRODUCTION

THE study of heterosis in chromosome behaviour and the genetics of chiasma frequency is a new line of work in the history of cytogenetics. Consequently, not much work has been done on this aspect. In 1936 Lamm's work on rye for the first time showed the effects of inbreeding on chromosome behaviour at meiosis where the inbred lines showed a reduction in chiasma frequency which, in many cases, was accompanied by considerable asynapsis². Inbred lines varied from one to the other just as would be expected from a segregation of genes controlling chiasma formation. Associated with differences in chiasma frequency was a difference in the size of bivalents between some lines. This was comparable to the genotypically controlled variation in chromosome size reported in *Lolium* by Thomas⁸. Thereafter, a few more studies on the behaviour of chromosome of rye were reported in detail³⁻⁷. The present paper is first of its kind on egg-plant.

MATERIALS AND METHODS

Six egg-plant varieties-purple slender, green long, Type 4, Purple Round, 9LO and K. 6312- and their 5 highest yielding and 5 lowest yielding crosses out of a 6 × 6 diallel set constituted the material for the present investigation. While chiasma frequency in parents was scored in flower buds

collected in the month of June 1967 and 1968, in the hybrids the same was done in buds collected only in June, 1968. Flower buds of suitable size were fixed in 1:3 acetoalcohol for 24 hours and thereafter transferred to 70% alcohol. Meiotic slides were prepared in 1.5% propiono-carmin by the usual method of Darlington and La Cour¹. Chiasma frequencies were scored at diakinesis and expressed in terms of number of chiasmata per cell and per bivalent.

RESULTS AND DISCUSSION

Chiasma frequency as observed in 6 varieties during 1967 and 1968 are given in Table I. Chiasma frequency of the hybrids and heterosis in them in regard to this character are presented in Table II.

It appears from Table I that varietal differences with regard to chiasma frequency during 1967 and 1968 are not much. Similarly the hybrids (Table II) excepting one also do not differ much from each other. But the distribution of chiasma frequency in parents as well as in hybrids, however, appears to be continuous. Thus it is probably under the control of polygenes like that reported in rye by Rees³⁻⁵. This observation is supported by the fact that the amount of heterosis with regard to this character is different in different hybrids as one expects in case of a polygenic trait.