JOURNAL GEOLOGICAL SOCIETY OF INDIA
Vol. 31, May 1988, pp. 491 to 494

MAGNETITE CONTENT AS A BASIS TO ESTIMATE OTHER MAJOR HEAVY MINERAL CONTENT IN THE SAND DEPOSIT ALONG THE NIZAMPATNAM COAST, GUNTUR DISTRICT, ANDHRA PRADESH

B. KRISHNAIAH SETTY* AND R. DHANA RAJU
Atomic Minerals Division, Department of Atomic Energy, Hyderabad 500016.

Abstract

Taking advantage of the sympathetic variation of magnetite content with that of (i) total heavy minerals, (ii) ilmenite, and (iii) pyriboles in sand samples drawn from the Nizampatnam deposit along the south Andhra coast, regression equations relating magnetite with others are calculated. Using the wt.% of magnetite and these equations, the wt.% of total heavies, ilmenite and pyriboles are calculated, which closely agree with the observed data, within a difference of 5%. The content of other important but minor heavy minerals like zircon, monazite and rutile need to be estimated by separation and microscopic grain-counting of only two fractions (i.e.) + 200 and -200 mesh-sizes, since these minor minerals are confined in these two fractions. By this method, consumption of heavy liquid and microscopic grain-counting can be substantially reduced by 70%, without sacrificing the accuracy for estimation of reserves of heavy minerals in this deposit.

Introduction

During laboratory investigations on the samples collected from the sand deposit along the Nizampatnam coast (Fig. 1), it was observed that the weight percentage of magnetite varies sympathetically with the weight percentage of (i) total heavy minerals, (ii) ilmenite and (iii) pyriboles (including micas). As magnetite can be easily separated with a low-power magnet, an attempt is made to find out whether the observed sympathetic variation can be made use of in estimating other heavy minerals so as to reduce the time-consuming and costly separation techniques involving heavy liquids, and painstaking microscopic grain-counting of a number of fractions for each sample. Further, such a method of estimation will facilitate in delineating the workable heavy mineral zones in the field itself, without waiting for laboratory study. The details of this method and its advantages and limitations are discussed in the present note.

Results

Tbe weight percentage of magnetite is plotted against the weight percentage of (i) total heavies, (ii) ilmenite and (iii) pyriboles (including micas) (Fig. 2). It may be observed that with increase in the magnetite content, there is a general increase in all these three constituents, thus demonstrating a positive correlation between the magnetite content on one hand and the rest on the other.

Linear regression equation is calculated taking magnetite content as X and other parameters as Y, and these are as follows:

$$Y \text{ (Total heavies)} = 3.1889\,X + 5.9304 \quad \ldots\ldots (1)$$
$$Y \text{ (Ilmenite)} = 1.4973\,X + 2.6401 \quad \ldots\ldots (2)$$
$$Y \text{ (Pyriboles)} = 0.6831\,X + 1.7305 \quad \ldots\ldots (3)$$

* Present address: 628/14, 4th Cross, 2nd Block, Banashankari 1st Stage, Bangalore 560050.

0016-7622/88/31-5-491/$ 1.00

Using the above equations, the regression lines are drawn (Fig. 2), and it may be observed that most of the plots in Figure 2 show only a little scattering from these lines. Further, the co-efficient of correlation (r) between magnetite content and other parameters is calculated, and found to be significant at 99.5% or more level of

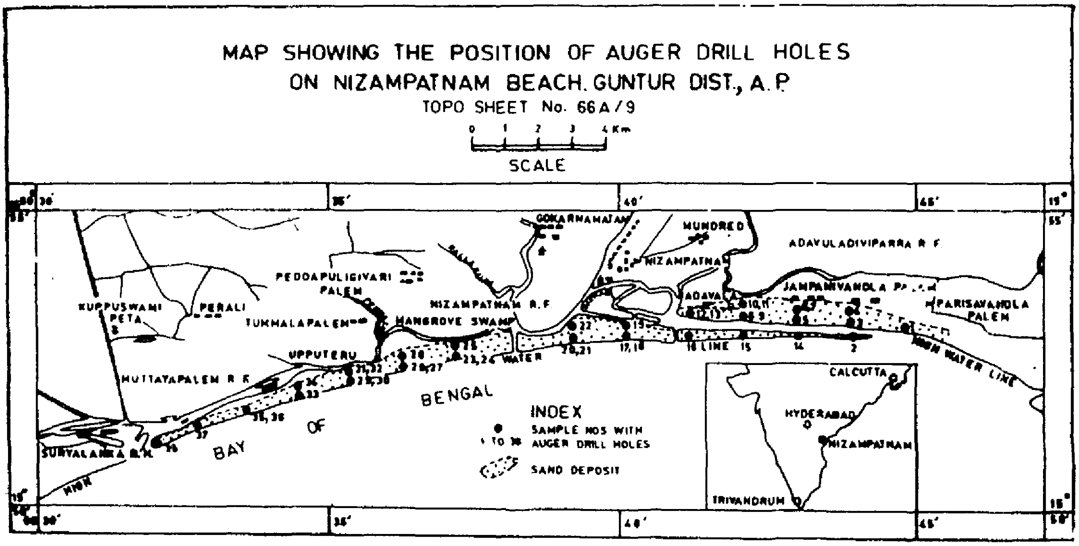

Figure 1.

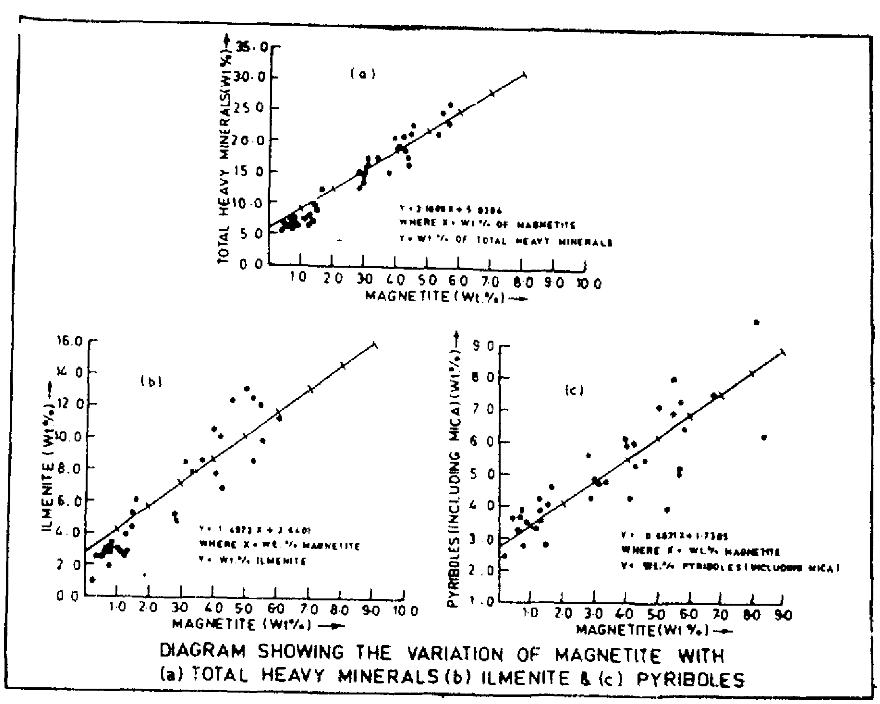

Figure 2.

confidence. The standard deviation for each of the three cases is estimated, and is given in the following together with corresponding coefficient of correlation (r).

	Co-efficient of correlation (r)	Standard deviation
Magnetite *vs* total heavies	0.7795	1.700
Magnetite *vs* ilmenite	0.6603	1.557
Magnetite *vs* pyriboles (+micas)	0.4833	0.0084

Number of samples (n) : 38.

As the correlation between the magnetite content and that of zircon and monazite is found to be poor, no attempt was made to calculate the regression equations for these.

Discussion

When once the magnetite content in any sample is known, the content of (i) total heavies, (ii) ilmenite and (iii) pyriboles (+ micas) can be estimated using the three regression equations. As the deposit under investigation contains ilmenite, magnetite and pyriboles as the major heavy minerals, the method suggested here helps in evaluating all the three major heavy minerals. Subtracting the sum of the weight percentage of these major heavies from the weight percentage of total heavy minerals obtained by using equation (1), it is easy to know the total content of all other minor heavy minerals like zircon, monazite, rutile etc. It is observed that most of the zircon and monazite of this deposit is present in +200 and -200 mesh (A.S.T.M. standard), and in order to arrive at their amounts in each sample, it is sufficient to do the microscopic grain-counting on only these two heavy fractions (non-magnetic). By this way consumption of bromoform can be substantially reduced as only two fractions are to be subjected for heavy liquid separation. Thus, using the above equations and grain-counting only + 200 and - 200 mesh heavy fractions, all the data required for reserve estimation of the deposit can be obtained. The significance of these equations for this deposit can be evaluated when the observed and calculated values of (i) total heavies, (ii) ilmenite, and (iii) pyriboles (including micas) for the entire deposit are closely agreeing, as shown in the following:

	Observed wt. %	Calculated wt. % using regression equations 1, 2 and 3*
Total heavy minerals	16.34	16.26
Ilmenite	7.37	7.49
Pyriboles (including micas)	4.01	3.94
Others**	1.72	1.59

* Using average magnetite content (3.24 wt. %) of all the samples (38).

** Include monazite, zircon, rutile, garnet and sillimanite.

Summary and Conclusion

The equations given here are applicable only to the deposit under investigation. However, the relationship between magnetite and other heavies, as is seen in the present deposit, appears to hold good for other deposits along parts of the Andhra coast, since the provenance rocks for the sands of south Andhra coast are similar.

As the investigations on other coastal sand deposits are under way, the suitability of this method can be verified, and if found valid, it is possible to arrive at similar equations that will be generally applicable to this type of deposits, particularly so when detailed work involving close-spaced sampling is required.

Acknowledgement: The authors record their sincere gratitude to the Director, Atomic Minerals Division, for providing an opportunity to work in the sand investigations and also for permission to publish the note. Grateful thanks are due to Dr. G. Prabhakar Rao and Shri D. N. Rama Rao for their keen interest during the course of the work.

(Received: June 26, 1987)