ABSTRACT

The phosphate bearing apatite-magnetite rock deposit of Sung Valley in East Khasi and Jaintia Hills districts of Meghalaya, India, is the only known large deposit of the kind in the North Eastern India. Though a lot of studies have been made of this phosphate bearing rock, these studies were confined only to geological mapping, petrological study and chemical analysis for phosphate content beside some base metals, rare and/or rare-earth elements. Therefore, in order to have a clear picture of the distribution of various rock forming elements as well as rare and rare-earth elements, the present research has been undertaken.

Since geological set up helps a lot in understanding the geological environment and collection of samples for geochemical study, the geology of the area has been studied thoroughly together with the rock types, viz., apatite-magnetite, carbonatite, ijolite, pyroxenite, serpentinite, syenite and uncompahgrite supplemented by petrological study and photomicrography as per requirement.

The methods of study involved the currently applied techniques. For collection of samples a reference geological map was obtained and the sample locations were marked thereon. Samples collected were processed in the laboratory and important minerals, e.g., apatite and magnetite, were separated by applying technique of heavy mineral separation as well as magnetic separation for their identification by grain study under microscope, infra-red spectroscopy and X-ray diffraction studies. Chemical analyses were done for surface samples, bore-hole core samples, stream sediment samples and soil in addition to the separated apatite and magnetite fractions.
For geochemical study, distribution of major and minor constituents, tabulation of analytical results of different samples, their dispersion patterns and geochemical variations were undertaken, beside showing element to element substitution during mineral crystallization. The correlation co-efficient and graphical interpretation of parameters have been given. As per necessity, infra-red spectroscopy and X-ray studies of both apatite and magnetite were also undertaken. Attempt has been made to deduce the geological thermometry for the formation of the crystals of apatite and magnetite as well as the cooling path of the molten magma. Phase systems obtained were compared with widely accepted established systems.

The economic usefulness as well as potentiality of the deposit of apatite and magnetite have been dealt with after their laboratory beneficiation test as well as on the basis of the mean values of $\text{P}_2\text{O}_5$ and $\text{Fe}_2\text{O}_3$ content for the apatite-magnetite rock. Since the apatite from Sung Valley cannot be directly used as rock phosphaste (fertilizer), commercial beneficiation of apatite is needed for the manufacture of phosphatic fertilizer or phosphoric acid. The magnetite obtained may be used as a suitable medium of coal washery.