PETROGRAPHY OF THE EMERALD-BEARING ROCKS OF MINGORA (SWAT STATE) AND PRANG GHAR (MOHMAND AGENCY) WEST PAKISTAN

By

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ABSTRACT

Emerald - bearing rocks are present near Mingora in Swat State, and Prang Ghar in Mohmand Agency. Rocks containing fuschite in addition to calcite and/or siderite are perhaps the most favourable for emerald, though some pegmatites and greenshists may also have emerald. The emerald and chrome-mica (fuschite) probably have some genetic bearing on the chrome- bearing ultramafic intrusions of the two areas.

INTRODUCTION

Emerald mining is carried out near Mingora, and there are reports of the existance of emerald in some rocks of Prang Ghar. The Department of Geology at the University of Peshawar has started a special project to investigate the emerald - bearing rocks of Mohmand Agency in order to find out proper locations for future exploration of the emerald gems. The Mohmand Agency extends between Malakand and Khyber Agencies of the former Northwest Frontier. Most of the work, at present, is conducted around Prang Ghar which is easily accessible by road from Peshawar.

During last summer, the emerald-bearing rocks of the two areas were investigeted by a party of M. Sc. students and some faculty members of this depart ment, and a few rock samples were collected for further investigation. The following report is based on the thin section study of these rock samples. The writer is thankful to the Department of Geology for providing the rock samples and thin sections for this paper. Thanks are also due Mr. Mansoor Akhtar of P.C.S.I.R. who looked into some sections and offered useful suggestions.

PETROGRAPHY

Mingora Samples :-

Emerald is present in carbonate - talc rocks, and quartz veins that are found along shear zones. The shear zones lie approximately at the boundary between greenschists and phyllitic schists. Associated with the shear zones are tectonically broken lenses of ultramafic material (Davies, 1962).

The rock samples are light green, coarse grained, carbonate rocks in which equidimensional calcite, with minor siderite, makes about half of the rock. Clear calcite has well developed polysynthetic twinning whereas, brown-stained siderite has no twinning. The brown colour of siderite is due to growth of iron oxide, especially along cleavages. Colourless to light green pleochroic chrome-mica (fuschite) constitutes about 25 percent of the rock. It resembles muscovite under microscope. Fibrous to minutely granular chlorite, making about 10 percent of the rock, is greenish pleochroic with a very small axial angle (many grains appear uniaxial) and nearly straight extinction. Some talc is intimately associated with chlorite.

The rest of the rock is composed of light brown, pleochroic clinozoisite with anomalous birefringence; minor quartz if any; and trace of green emerald.

Prang Ghar Samples :-

The geologic traverse, made in Prang Ghar, reveal dominantly argillaceous metamorphosed sediments (slates, phyllites) and less abundant carbonate rocks and greenschists. Associated with these are pegma-

tites and quartz veins. Although emerald mineralization has taken place in carbonate rocks, pegmatites, and greenschists, some may have no emerald at all.

The samples described here are from carbonate rocks. They have brown colour and coarse texture. Concentration of quartz, mica and carbonates, in certain bands, is a common feature. Untwinned siderite is the most dominant mineral (about 60 percent). It is altered and secondary iron oxide has been well developed along cleavages and grain boundaries, thus giving the rock a brownish colour. Pleochroic chlorite, generally in the form of bent fibers; pleochroic fuschite; and quartz make the rest of the rock. Minute needles of yellowish brown plechroic rutile (?), traces of green emerald are also present.

The emerald crystals in rocks of Prang Ghar area are deep green, striated elongate prisms with poorly developed cleavage at right angles to the c-axis. Under microscope, the emerald grains are light green, weakly pleochroic and uniaxial. Fractures parallel and transverse to c-axis are present and most of the fractures contain secondary yellowish brown material, A few minute inclusions (that have higher index than the emeraled) with low birefrengence are also seen.

DISCUSSION

The above description indicates that the presence of emerald in the two areas under discussion is confined to low grade metamorphic rocks especially carbonates; some pegmatites and quartz veins. Chrome-bearing ultramafic rocks are closely associated with the emerald bearing rocks of Mingora. As pointed out by Davies (1962), ultramafic intrusions have some bearing on the development of emerald. There too are chrome-bearing ultramafic intrusions in Malakand Agency. Though these intrusions do not occur in close association with the emerald bearing rocks, the presence of chrome-mica suggests some genetic relation between these instrusions (or, most probably, some unexposed ultramafic rocks that exist close by) and the emerald-bearing rocks. How much is the effect of the ultramafic intrusions on the development of emerald in the two areas is a question to be answered after the detail mapping. The most favourable localities of emerald development are perhaps those where chrome-micas are abundant-

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