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THE AMERICAN MINERALOGIST, VOL. 43, SEPTEMBER-OCTOBER, 1958

GOETHITE-HEMATITE RELATION—AN ORE MICROSCOPE OBSERVATION

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To the south of Chaibasa (22°33′:85°28′), Singhbhum, India, near the northern limit of the Kolhan basin, the fracture zones formed by post-Kolhan deformation, have been mineralized by a metalizing solution. The mineralization is more common in the competent sandstone than in the shale, and also along the sandstone-shale boundary. The mineralizing solution was ferriferous in the first phase and formed such minerals as limonite, goethite and specularite, these being followed by a phase of formation of the manganese minerals psilomelane, pyrolusite, and its idiomorphic form. The important textural relations are the core and rim replacement of goethite by psilomelane, and an intergrowth relation between fibrous goethite and hematite. The latter texture is described in this note.

Such a specimen of goethite on analysis shows a higher content of Fe_2O_3 (91.3%), than normal, because of the included hematite plates.*

The intergrowth has been studied on different polished surfaces with respect to the fibre axis. Goethite, the host mineral under reflecting microscope is greyish with perceptible differential adsorption in some specimens, being brighter parallel to the fibre axis. Unusual for goethite, the bireflectance is very weak but with the commoner orange internal reflection. These properties are variable since they depend on the content of adsorbed water (Ramdohr 1955). The mineral is stained brown by $SnCl_2$ ($1\frac{1}{2}$ minute). The reflectance measured in green light in air is 19.3% parallel to the fibre axis and 17.5% across. Specimens polished perpendicular to fibre axis shows no notable variation in reflecting power.

Hematite inclusions occur as continuous plates within the host. In

* The planes of hematitization are actually micro S-planes produced by a post-Kolhan deformation, the pattern of which is being studied in this laboratory.

sections with the orientation parallel to the fibre axis, the plates show an intersecting relation, with the fibre axis bisecting the acute angle (Fig. 1). Sections polished perpendicular to the fibre axis, reveal the striking parallelism of the plates. The width of the individuals depends on their inclination to the plane of section. Such plates are locally much concentrated to give a striped look to the mineral. The reflectance of the mineral in green light in air is 24%.

The nature of the hematite plates suggests an exsolution origin for the texture, particularly because of lack of thickened intersections.

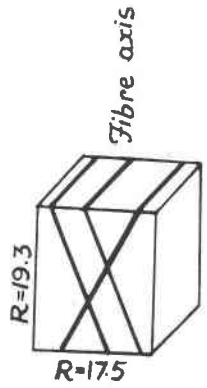

FIG. 1. Diagrammatic relation between goethite (white) and hematite plates (black).

(Bastin 1931). But no such exsolution pair is known (Ramdohr 1955). Closer examination of the plates under high magnification however reveals a somewhat irregular nature of the margin of the plates, which together with their continuous character suggest a replacement origin for the texture (Bastin 1931). Conversion of fibrous goethite to hematite is known to take place at a temperature of about 150° C. in a neutral medium (Smith and Kidd 1949). Association of manganiferous minerals in this case may however suggest a slightly lower pH value than neutral conditions.

ACKNOWLEDGMENT

The writer is indebted to Professor S. Ray, Department of Geology, Presidency College, for his kind help in this study.

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