08.4-22 X-RAY STUDY OF CORROSION PRODUCTS OF SOME ANCIENT EGYPTIAN METALS AND ALLOYS. By
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The corrosion product minerals which were formed on the surface of several Egyptian metal artifacts were extensively studied by X-ray diffraction analysis.
X-ray diffraction patterns of these corrosion products show no difference between them and their corresponding prototype minerals in the earth crust. The sequence of mineralization products is found to be: cuprite, which is the primary alteration product; then another copper mineral such as atacamite, paratacamite, nantokite, malachite, azurite, chalconatronite. The existence of such big varieites of basic copper chloride minerals is significant to the saline nature of Egyptian soils. The environmental conditions, specially the concentration of the surrounding ions, play the most important role. However, endogeneous factors concerning the constituting metals cannot be neglected. Selective mineralization represented by surface silver enrichment and lead depletion is sharply proved. Lead acts as an element protecting artifacts from corrosion.

08.4-23 AN ANALYTICAL MODIFICATION OF WINCHELL DIAGRAM FOR DETERMINATION OF GARNET COMPOSITION.
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Ford (Am. J. Sci., 40, 33-49, 1915) used the index of refraction n and the specific gravity D, for physical determination of molecular composition of garnets, which may be solid solutions of the following main end-members: almandine (Al), andradite (An) grossular (Gr), pyrope (Py) and spessartite (Sp). Later, Winchell (1951) replaced D with a_o, the cell edge. The present authors have already treated the garnet problem, but for three-components only (An. Acad. Brasil. Ciênc., 48 (1), 57-68, 1976).
The present method modifies the Winchell diagram by replacing a_o with $\Delta d = d(420)$ garnet - $d(10\bar{1}1)$ quartz, keeping n^o and adding D. The experimental error on Δd is low ($\pm$ 0.001Å), thanks to the use of quartz as an internal standard. The index n, obtained by the immersion method under the microscope, has an error of 0.001. Larger errors affect D ($\pm$ 0.01 to 0.1) due to inclusions in the garnet and to the determination method itself. The values of Δd, n and D are plotted on orthogonal X, Y and Z axes for each of the end-members. The resulting 5 points are the corners of an asymmetric trigonal bipyramid, which defines 6 external faces and 4 internal planes. The equation of each of the 10 planes, expressed in the form Ax + By + Cz + D = 0, is calculated in terms of the coordinates of the three points in the plane; for instance

$$\begin{vmatrix} x & y & z & 1 \\ \Delta d' & n' & D' & 1 \\ \Delta d'' & n'' & D'' & 1 \\ \Delta d''' & n''' & D''' & 1 \end{vmatrix} = 0$$

The necessary constants are as follows:

		Δd	n	D
Almandine	(1)	0,766	1,830	4,318
Andradite	(2)	0,649	1,887	3,859
Grossular	(3)	0,693	1,734	3,594
Pyrope	(4)	0,781	1,714	3,582
Spessartite	(5)	0,745	1,800	4,190

If only one equation is satisfied in the determination of a given sample, the sample is a three-component garnet. The equation also indicates the involved three end-members, whose proportions may be determined in a separate equilateral triangle diagram. If two equations are simultaneously satisfied, the plotted point lies on a straight line and the garnet is a binary solid solution. When 3 equations are satisfied the point coincides with one vertex of the bipyramid, which means a pure end-member. If no equation is satisfied, the garnet must be a four- or five-component solid solution, and the composition may be solved by appropriate quadrangle or pentagon diagrams. In extremely difficult but rare cases of more than 5 components, the composition can be determined only by additional chemical analyses.

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08.4-24 A SYSTEMATIC APPROACH OF ORE MINERALS DETERMINATION BY THEIR REFLECTANCE VALUES, PHYSICO-CHEMICAL AND STRUCTURAL PARAMETERS. By
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During the past two decades, the study of ore minerals has made remarkable progress and it is readily possible to identify polished mineral surfaces by three reliable parameters:
1) The Physical Parameter is determined by the measurement of reflectance values, under standard conditions, with highly sensitive photomultiplier tubes, and by the recognition of their diagnostic optical properties with the ore microscope.
2) The Chemical Parameter includes quantitative determination of chemical constituents by electron microprobe measurements.
3) The Structural Parameter is obtained by microanalysis by X-ray powder diffraction.
Six determinative tables, for identifying 150 ore minerals, have been established by correlating previously unpublished reflectance data (in white light) with diagnostic optical properties, scratch hardness tests, chemical composition, crystal structure and space group.