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MINERALOGICAL NOTES

HOW MANY MINERALS?

MICHAEL FLEISCHER,[1] *U. S. Geological Survey, Washington, D. C. 20242.*

The question is frequently asked, "How many minerals are there?"; the answers scattered through the recent literature vary widely, but are usually in the range 1,500 to 2,500. The difficulties involved in answering are perhaps more evident if the question is reworded: "How many of the existing mineral names (perhaps 10,000 to 20,000) are now considered to represent independent mineral species?"

The answer clearly depends on the definition of independent mineral species, as pointed out by Strunz (1966, p. 17–19), who gives the number as 1,580, but adds, "Diese Statistik ist nicht ganz befriedigend, da der Begriff der 'Mineralart' einer noch strengeren Definition und Anwendung bedarf, als es derzeit möglich ist." Few textbooks or reference works discuss the problem at all; among the exceptions are Hey (1955) and Mason and Berry (1968). They point out that there are problems even in naming complete binary solid solution series. For example, the olivine series, Mg_2SiO_4-Fe_2SiO_4, has been called by various writers one, two, or six minerals (I call it two). The four-component columbite-tantalite series $(Fe, Mn) (Nb, Ta)_2O_6$, has been called one, two, or four minerals (I call it four).

At this point one might be tempted to generalize that a mineral can be called a different independent species for each predominant cation in each structural position, as I have done in the two examples cited. This does not work, however, even for the relatively simple plagioclase system, $NaAlSi_3O_8$-$CaAl_2Si_2O_8$; it also does not correspond to the usually accepted dividing points in the series clinozoisite-epidote or clinozoisite-piemontite not to mention the complications in such groups as the pyroxenes, amphiboles, and micas. These are problems to be faced by the special committees on Mineral groups of the IMA Commission on New Minerals and Mineral Names, two of which (Pyrochlore group, Amphibole group) have begun their work, with others hoped for.

I have had occasion recently to compile a list of minerals, in connection with the revision of mineral definitions in the third edition (in preparation) of the American Geological Institute's Glossary of Geology and Related Sciences. My count, as of January 1, 1969, by arbitrary decisions, gives 1,950 mineral species; your count would doubtless be different.

During the years 1962–1966, the IMA Commission on New Minerals

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[1] Publication authorized by the Director, U. S. Geological Survey.

and Mineral Names approved 205 new mineral names, so that about forty new species are being added annually.

REFERENCES

HEY, M. H. (1955) *An Index of Mineral Species and Varieties, Arranged Chemically, 2nd Ed.* British Museum Natural History, p. xiii–xiv.

MASON, BRIAN, AND L. G. BERRY (1968) *Elements of Mineralogy.* W. H. Freeman and Co., San Francisco, p. 195–196.

STRUNZ, HUGO (1966) *Mineralogische Tabellen, 4th Ed.*, Akad. Verlagsges., Leipzig.

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THE SIGNIFICANCE OF TWINNING IN Ag_2S

L. A. TAYLOR, *Geophysical Laboratory, Carnegie Institution of Washington, Washington, D. C. 20008.*

ABSTRACT

Twinning in Ag_2S is observed to form, on heating, well below the 177°C inversion from low-temperature Ag_2S, acanthite, to the high-temperature form, argentite. This twinning, premonitory of the inversion, is preserved upon subsequent cooling to room temperature. Therefore, the presence of twinning in Ag_2S cannot be used as a minimum-temperature indicator: the high-temperature crystal structure may never have existed.

INTRODUCTION

Evidence for the *bcc*[1]$\rightleftarrows$monoclinic phase transition of Ag_2S has been used extensively as a minimum temperature indicator of mineral formation in ore deposits. Ramdohr (1960) stated that the twinning frequently observed in natural Ag_2S results from this inversion, and that the presence of twinning indicates initial deposition above approximately 177°C; he considered Ag_2S which is untwinned as having formed below this temperature. However, as discussed below, this twinning need not be associated with the inversion.

Two polymorphs of Ag_2S composition have been described as distinct mineral species. Argentite commonly occurs with cubic morphology and displays characteristic twinning in polished sections. Acanthite has monoclinic structure and morphology and is usually untwinned in polished sections. The compound Ag_2S inverts reversibly from a low-temperature monoclinic form to a higher-temperature cubic (*bcc*) form (Kracek, 1946). This transition is composition sensitive: $177.8° \pm 0.7°C$ in the presence of sulfur, $176.3° \pm 0.5°C$ in the presence of silver (Kracek, 1946). Ag_2S with the cubic structure is nonquenchable–*i.e.*, it will not persist metastably below the transition temperature–in this respect it is similar to β quartz.

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[1] Body-centered cubic.