A comment on “An evolutionary system of mineralogy: Proposal for a classification of planetary materials based on natural kind clustering”

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ABSTRACT

The classification and nomenclature of mineral species is regulated by the Commission on New Minerals, Nomenclature and Classification of the International Mineralogical Association (IMA-CNMNC). This mineral species classification is necessary for Earth Sciences, as minerals constitute most planetary and interstellar materials. Hazen (2019) has proposed a classification of minerals and other Earth and planetary materials according to “natural clustering.” Although this classification is complementary to the IMA-CNMNC mineral classification and is described as such, there are some unjustified criticisms and factual errors in the comparison of the two schemes. It is the intent of the present comment to (1) clarify the use of classification schemes for Earth and planetary materials, and (2) counter erroneous criticisms or statements about the current IMA-CNMNC system of approving proposals for new mineral species and classifications.

Keywords: Classification, nomenclature, mineral species, IMA-CNMNC, “mineral kinds”

INTRODUCTION

Hazen (2019) proposed setting up a classification “of condensed planetary materials into natural kinds based on the observed range of chemical and physical properties of any natural condensed phase—properties that reflect not only a substance’s major element chemistry and crystal structure, but also its paragenetic mode.” We make classifications to help us in our understanding of how natural processes work or how we may more efficiently deal with the objects under consideration. Multiple classifications pertaining to the same kingdom can coexist without conflict, being individually useful for the purposes for which they were developed. We also need to recognize that classifications are a human artifact, which we have progressively developed in all areas of Natural Science.

We recognize that Hazen (2019) has every right to develop a classification system specifically designed to characterize planetary evolution. However, we consider it unfortunate that Hazen (2019) chose to be ambivalent about the relationship between his ideas and the IMA-CNMNC classification. On the one hand, he recognized the important role of the IMA-CNMNC in defining minerals, a process without which we cannot deal with them in any scientific context. On the other hand, he took a confrontational approach to criticizing the IMA classification in terms of several areas where he feels it is not optimum in terms of studying planetary evolution. Why should the IMA-CNMNC classification be optimum for studying planetary evolution? It was not set up for this purpose. If Hazen (2019) wishes to set up a more suitable classification for planetary materials, this will not conflict in any way with the IMA-CNMNC classification, as it is done for a completely different purpose, in the same way that structure hierarchies of minerals or the gemological classification of diamonds do not conflict with the IMA-CNMNC classification of minerals. However, there are several factual errors and unjustified negative comments in the criticisms of Hazen (2019), and we consider it important to correct these so that they do not propagate throughout the Earth Sciences community.

HISTORIC MINERAL CLASSIFICATION

Mineral classification was created through name-giving (definition), which is based on description. It has progressed through both promotion and relevance of use, the classifications that were useful stuck around and were built upon or refined, and those that were not useful died out. At any one-time, mineral classifications can be seen as a representation of our collective level of general understanding of the mineral kingdom, the boundaries of the kingdom and as a guide for the methods in which scholars and scientists are working toward furthering that understanding.

“The first step in wisdom is to know the things themselves; this notion consists in having a true idea of the objects; objects are distinguished and known by classifying them methodically and giving them appropriate names. Therefore, classification and name giving will be the foundation of our science.” (Linnaeus 1735, translation from Engel-Ledeboer and Engel 1964).

Prior to Linnaeus (1735), the classification of minerals has progressed from the largely descriptive works of Agricola (1546), the often cited “father of mineralogy” and de Boodt (1609). Within their classification boundaries are objects we now consider as rocks and fossils, which alongside minerals were described on the basis of a variety of properties, including additional “properties”