

## **Supplementary Read-Me File: Instructions for Supplementary Table 1**

### **An evolutionary system of mineralogy, Part VI: Earth's earliest Hadean crust (> 4370 Ma)**

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Supplementary Table 1 is an xlsx file that records the modes of formation and other information related to 442 minerals proposed to occur on the Hadean Earth prior to 4.37 Ga (billion years ago). Of these minerals, 148 (*column AG*; “*E only*”) are proposed to have occurred on Earth but have not yet been identified in meteorites, 180 (*column AH*; “*M only*”) are known to occur in meteorites but are not thought to have formed on Earth prior to 4.37 Ga, and 114 (*column AI*; “*M+E*”) are ascribed to both meteorites and early Earth.

*Row 1* indicates the shapes of the icons for the network graph (Figures 1 and 2).

*Row 2* indicates the abbreviations of the paragenetic modes.

*Row 3* indicates the total number of minerals under each paragenetic mode.

*Column A* lists mineral names, most of which are approved by the International Mineralogical Association (IMA; see <https://rruff.info/ima>). However, more than 50 phases, highlighted in blue, do not have officially approved names. Some of these solids are amorphous phases that are considered by the IMA. Others are mineral group names (e.g., hornblende, biotite, plagioclase) or as yet unnamed minerals.

*Columns B to N* (header highlighted in yellow) represent 13 processes by which meteorite minerals are known to form. A “1” in a matrix element indicates that the corresponding mineral (row) forms by that process (column). They include:

- *Column B*: 17 minerals formed in AGB stars.
- *Column C*: 21 minerals formed in Type-II supernovae
- *Column D*: 4 minerals formed in C-Novae
- *Column E*: 2 minerals formed as circumstellar condensates
- *Column F*: 9 minerals formed as low-T “ice” condensates in dense molecular clouds
- *Column G*: 23 minerals formed as primary condensates in calcium-aluminum inclusions
- *Column H*: 27 minerals form in ultra-refractory inclusions
- *Column I*: 8 minerals formed in amoeboid olivine aggregates
- *Column J*: 42 primary igneous minerals in chondrules
- *Column K*: 91 primary planetesimal minerals in achondrite meteorites
- *Column L*: 38 meteorite minerals formed by impact processes
- *Column M*: 97 meteorite minerals formed by low-T aqueous alteration
- *Column N*: 77 meteorite minerals formed by thermal alteration

Columns O to AF represent 19 processes by which early Earth minerals are thought to have formed. A “1” in a matrix element (highlighted in light blue) indicates that the corresponding mineral (row) forms by that process (column). They include:

- Column O (UMA): 41 minerals formed in ultramafic igneous rocks
- Column P (MAF): 39 minerals formed in mafic igneous rocks
- Column Q (SIL): 32 minerals form in Si-rich igneous rocks
- Column R (ANO): 15 minerals formed in anorthosites
- Column S (FUM): 23 minerals formed in reduced volcanic fumaroles
- Column T (ZEO): 27 minerals formed in igneous rock vesicles, notably zeolites
- Column U (HYD): 54 minerals formed in
- Column V (HSG): 30 minerals formed in hydrothermal springs and geysers
- Column W (SHT): 32 minerals formed in seafloor hydrothermal vents
- Column X (XEN): 14 minerals formed by thermal metamorphism of igneous xenoliths
- Column Y (SER): 46 minerals formed by serpentinization or seafloor weathering
- Column Z (LTA): 67 minerals formed by low-T aqueous alteration
- Column AA (AUT): 39 minerals formed by marine authigenesis
- Column AB (ICE): 3 minerals formed by freezing aqueous solutions
- Column AC (IMP): 41 minerals formed by terrestrial impacts
- Column AD (LIG): 12 minerals formed by lightning strikes
- Column AE (EVA): 14 minerals formed by evaporation
- Column AF (PHO): 5 minerals formed by photo-oxidation/reduction

Column AJ lists mineral names. Earth minerals (but not from meteorites) are highlighted in green; minerals from both Earth and meteorites are colored in orange; minerals from meteorites (but not Earth) are colored in red.

Column AK indicates the number of different chemical elements in the formula.

Column AL gives the chemical formula

In addition, Row 1 indicates the shapes of the icons for the network graph (Figures 1 and 2). Row 2 indicates the abbreviations of the paragenetic modes. Row 3 indicates the total number of minerals under each paragenetic mode.

Reference:

Hazen, R.M., and Morrison, S.M. (2022) On the paragenetic modes of minerals: A mineral evolution perspective. *American Mineralogist*, 107, 1262–1287.