L2/08-390

Proposal for Alchemy Symbols in Unicode

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October 27, 2008

This proposal envisions the creation and organization of a code block devoted to alchemical symbols. Some alchemical symbols have already been included in existing blocks, especially the Miscellaneous Symbols block (u2600). (See Table 1. Existing Coverage of Alchemy in Unicode.) The idea of organizing a block for alchemical symbols holds clear benefits for historians, chemists, philologists, literary scholars, and their professional colleagues; for a large community interested in alternative knowledge and New Age disciplines; for writers and artists, e.g, in the fantasy genre, developing creative works that deal with themes and history of alchemy; and, potentially, another large community working in computer gaming, graphics, and fonts.

Alchemical symbols were in use from the fifth or sixth century C.E. through at least the end of the eighteenth century. These symbols continue to be used extensively in the present day, in scholarly literature, in New Age texts, in creative works, and in the gaming and graphics industries. Alchemical symbols were especially important in Europe after the fourteenth century when there was an explosion in their use. European alchemists, natural philosophers, chemists, and apothecaries developed and used several parallel systems of symbols but many symbols created by Greek and Syriac writers in late antiquity and medieval Arabic writers were known and carried forward over the entire thirteen centuries. Alchemical works published in what is best described as a textbook tradition in the seventeenth and eighteenth centuries routinely included tables of symbols that probably served to spread their use.

The NSF- and NEH-funded Chymistry of Isaac Newton Project at Indiana University, with the help of the Chemical Heritage Foundation in Philadelphia, has gathered a collection of those synoptic tables as an initial step toward developing a Unicode proposal for alchemical symbols. Sample tables are shown in Figure 1, *Explanation of the Chimical Characters* from Nicaise Le Fèvre, *A compleat body of chymistry*, London, 1670, and Figure 2, Basil Valentine, *The Last Will and Testament of Basil Valentine*, 1671. There are many others.

The modern tradition of history of alchemy and alchemical symbols was put on a solid footing in the 1880s and 1890s by Marcelin Berthelot in several works but especially *Histoire des Sciences. Chimie au Moyen Âge* (1895). Berthelot provided lists of symbols from the Greek, Syriac and Arabic writers and discussed their transmission. In 1928, Fritz Lüdy-Tenger published *Alchemistische und chemische Zeichen*, an inventory of alchemical and pharmaceutical symbols and variants that included 3695 symbols in 128 tables (see Figure 3 for a sample table). This inventory was organized morphologically but did not include a cross index or a detailed account of the sources of the symbols.

Surprisingly, perhaps, the inventory is not exhaustive—we have encountered a number of symbols in early modern writers that are not present in Lüdy-Tenger's tables. Wolfgang Schneider's *Lexicon alchemistisch-pharmazeutischer* (1962) covered much the same material as Lüdy-Tenger but organized it semantically and supplemented the lists of symbols with a lexicon and synonymy.

Font resources

It would probably require a considerable amount of scholarship and research to identify and organize the entire Lüdy-Tenger and Schneider inventories and such work is certainly outside the scope of the design of the Chymistry of Isaac Newton Project design. Nevertheless we have already created font resources that will enable other interested colleagues and projects to pursue further research and publication.

Newton made extensive use of these symbols in his own alchemical manuscripts and the Chymistry of Isaac Newton Project has created and expanded an Open Type font, named *Newton*, with all of the symbols he used to support the online delivery of the alchemical manuscripts through the Indiana University Digital Library Program.

To provide further resources for the development of the Unicode proposal, our project staff members have recently created another Open Type font, named *LuedyTenger* that includes all 3695 symbols in the Lüdy-Tenger inventory. (Note that font names are limited to printable ASCII characters 33-126 so we followed the usual convention for rendering umlauts in German when we named the font.)

Basic Strategy

Our basic strategy is to concentrate first on a core group of symbols, perhaps as many as two hundred, that were recognized and organized into tables by European writers working in the alchemical textbook tradition approximately 1620–1720. It seems reasonable to expect that future projects, publishers, and authors would want to expand the Alchemy Unicode block as scholarship progresses beyond current frontiers in this area. However, the core group of symbols represented in our proposal includes all symbols found in the vast majority of the western alchemical tradition and the alchemical works of major figures such as Newton, Boyle, and Paracelsus.

The early modern alchemical textbook writers were already aware of the some of the history of their literature. They recognized the ancient connections made between the planets and naturally occurring ores and metals and carried forward Aristotelian associations with the four elements and vegetative and putrefying processes. Their synoptic symbol tables included most of the Arabic, Syriac, and Greek symbols and further noted the existence and currency of many alternate symbols and variants for the same substances and processes.

Our Table 2, appended below, sets out the core group of symbols usually included in their synoptic tables and we propose to begin discussion of a possible Unicode Alchemical Symbols block with these symbols.

Possible Future Expansions of the Alchemical Block

The Greek, Syriac, and Arabic alchemical writers composed their texts in non-Latin scripts and used the alchemical symbols in ways that reflect those writing systems. Berthelot tells us, for example, that the Syriac authors carried over the Greek symbols but wrote them horizontally rather than vertically. Our group and collaborators are certainly equipped to assess the use of alchemical symbols in Latin scripts but expanding this preliminary proposal to cover classical and Arabic alchemy would require discussions with friends and colleagues working directly with those traditions. Furthermore, the Unicode Consortium already has standards for Greek, Syriac, and Arabic scripts, and any expansions of the proposed alchemical block to include the earliest texts of the tradition would probably also need to take those standards into account in an integral way.

We have also chosen to limit the coverage of this proposal to 1720. After the groundbreaking work of Boyle, Newton, and their contemporaries at the end of the seventeenth century, "chymical" authors like Geoffroy and Gellert began to reflect on possible underlying affinities and relations between the substances they were investigating experimentally. By 1720, these new chymical authors began to attempt to modify the received set of alchemical symbols to reflect their new ideas and theories. Their elaborate graphical solutions were both ingenious and prolific but ultimately idiosyncratic. Extension of the proposed Unicode alchemical block to include these systems will require the use of combining characters and much careful attention to the details of their respective theories. That work is beyond the scope of what we can contribute without effective collaboration from colleagues interested in those particular developments.

Newton's Own Modified Alchemical Symbols

Authors working after Paracelsus and before Geoffroy tended to use alchemical symbols primarily as simple substitutes for the written words they stood for. It is common in Latin alchemical texts of this period to find the symbols being declined grammatically, e.g. ♁^{ii}, *antimonii.* It is much less common to find instances in which alchemical symbols were modified or qualified to reflect putative or recognized distinctions or principles in the way that writers of the next few decades would do. In some notebooks, however, Newton notably did modify a number of basic alchemical symbols to distinguish between purified substances and their ores, and between purified substances and their sublimates. We have so far identified twenty characters that Newton modified in this way, almost all of them in his laboratory notebooks, which are presently drawing the attention of historians of science.

Newton's basic practice was to adjoin a small 'o' to the received alchemical symbol to connote the ore of the substance and, to connote the sublimate, he usually adjoined a

small four-bar (or eight-spoked) asterisk, '⁕', a common symbol for sal-ammoniac, thus likely suggesting the volatility required for the formation of sublimates in retorts. It is interesting to note that when Newton wrote a symbol for sal-ammoniac itself, he always used a three-bar inline sextilis, '⚹', rather than the four-bar form he usually used in the sublimate symbols.

Sixteen of Newton's modified symbols can be formed as ligations of one of two modifier characters and a set of base symbols in the existing Unicode code charts and proposed alchemical block. The other four modified symbols are not so easily formed and have been included in the proposed alchemical block in Table 2 because of Newton's importance to modern scholarship and publishing and to the evolution of alchemy itself. We plan to provide a Unicode Technical Note that discusses the whole symbol set and part of that UTN will also explain how to construct the modified characters which can be formed by ligation. The ligations have been set out in Table 3, below.

Brief Discussion of Conventions Observed in Tables 1, 2, and 3

Names of the proposed Unicode characters are usually given in English while Latin equivalents are handled as aliases (= lixivium). Alchemical terms in English, however, often are precisely their Latin equivalents and have entered English directly as a result. Obvious examples are aquafortis and aqua regia. We consulted the Oxford English Dictionary whenever we faced this problem: Where the OED uses the Latin term as the lemma/headword, we have retained the Latin as the character name. Where the OED has an English term as the lemma/headword, we have named the character accordingly, with a Latin alias, where appropriate. Such practice will correspond to the terminology generally used by scholars, writing in English, when referring to these alchemical substances, processes, etc.

Tables 1 and 2 are constructed to adhere to Unicode Code Chart formats. We have organized the symbols in Table 2 into categories for Substances, Processes, Apparatus, Time, and Measures, following a suggestion by Andreas Stötzner of the Deutsche Industrie Norm group which participates in ISO.

Table 3 is intended to be a prototype of part of a future Unicode Technical Note on the alchemy symbols which would also include discussion of the history, meaning, and uses of the symbols. Table 3 simply sets out the ligations needed to produce Newton's ore and sublimate symbols using the alchemy characters and the DEGREE ° U+00B0 and ASTERISK * U+002A characters. This three-bar symbol, '*', which is rotated thirty degrees from the orientation of the sextilis, '⚹', combines conveniently with the crosses in FEMALE SIGN ♀ U+2640, and EARTH ♁ U+2641 to produce the four-bar forms that Newton drew for sublimated copper and antimony in his notebooks. One of his symbols, SUBLIMATE OF ANTIMONY 2, '♁' actually uses the modern three-bar asterisk above, rather than a four-bar form.

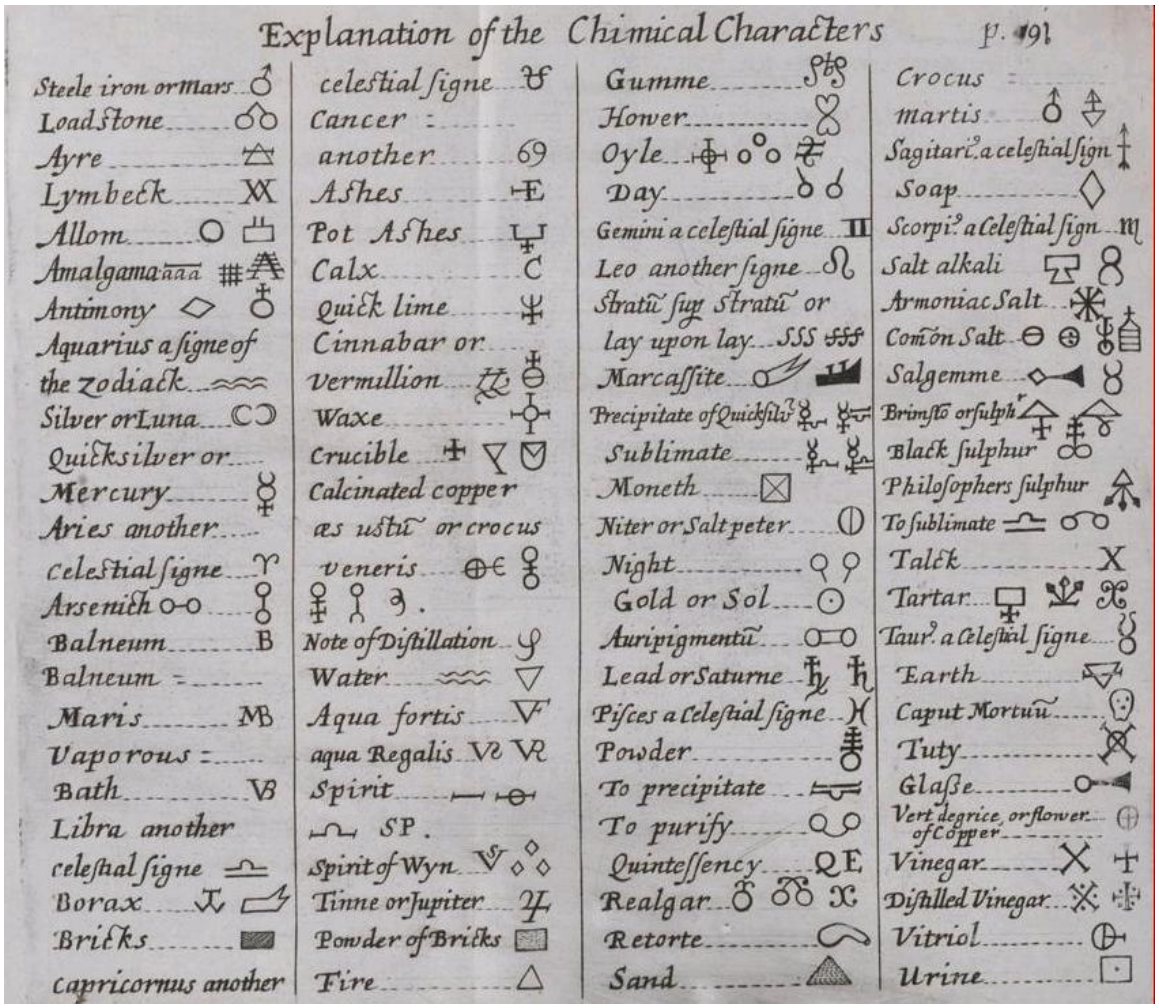

Figure 1. *Explanation of the Chimical Characters* from Nicaise Le Fèvre, *A compleat body of chymistry,* London, 1670.

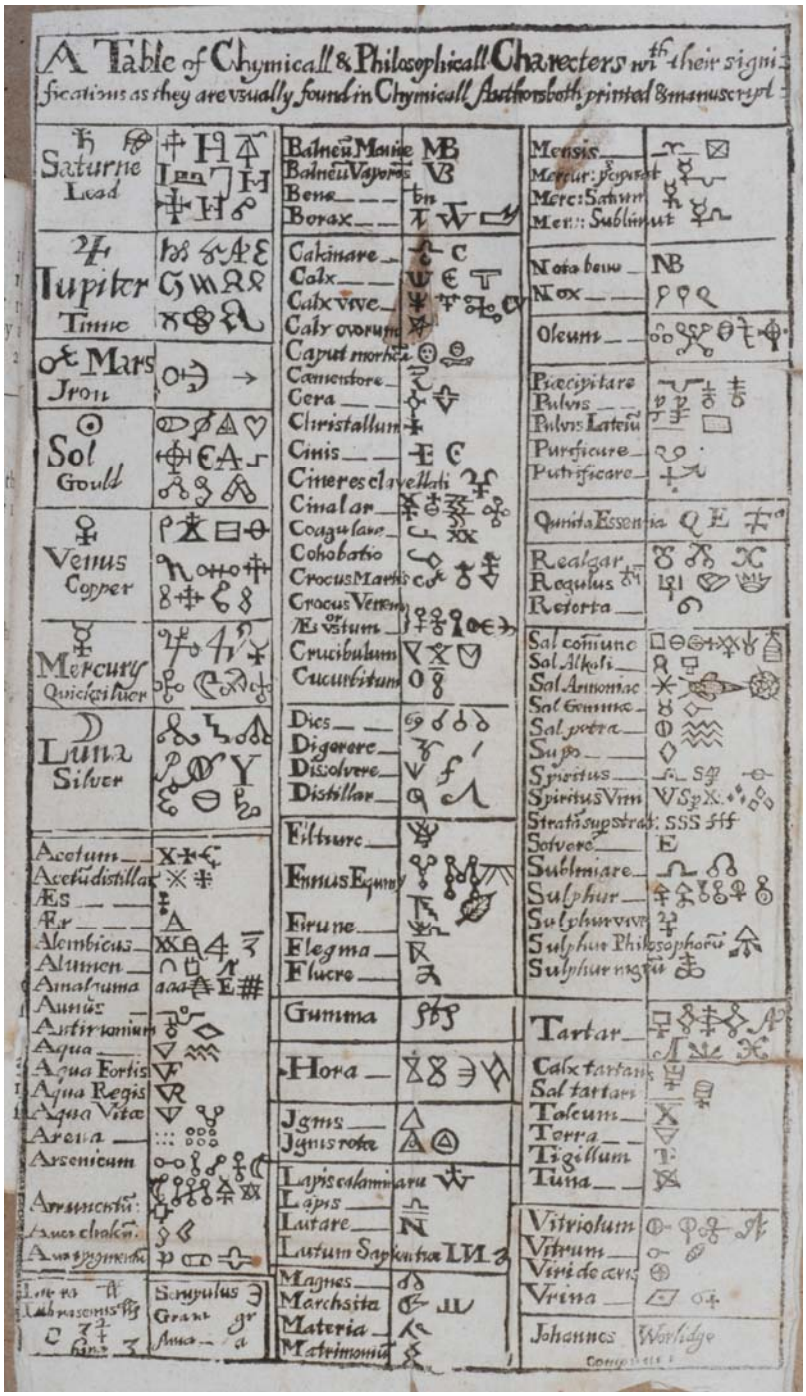

Figure 2. Basil Valentine, *The Last Will and Testament of Basil Valentine,* 1671.

TAFEL 38

	Bolus communis		Sal commune
	Aurum, Philosophus		Calx
	Cucurbita		Lapides
	Calx metallorum		Sulfur
	Lignum		Cerussa
	Autumnus		Antimonium, Calx viva, Argentum vivum, Cuprum, Color roseus.
	Alumen		Antimonium, Color roseus
	Calx ovorum putaminum		Arsenicum album
	Calx		Antimonium spagyr. praep., Argentum vivum
	Crucibulus		Argentum vivum
	Sal petrae, Aphronitrum, Flos parietis, Faex nitri, Nitrum Graecorum, Nitrum stolidum.		Calx
	Acetum		Amalgama
	Retorta		Filtrare
	Vitriolum Romanum		Aqua Mercurii
	Marcasita		Filtrare

Figure 3. Table 38 from Lüdy-Tenger's inventory of alchemical symbols.

Table 1. Existing Coverage of Alchemy in Unicode

Unicode	Symbol	Description
0292	ʒ	EZH = dram
2108	℈	SCRUPLE
2114	℔	LB BAR SIGN = pound = libra
211E	℞	RECIPE
2125	℥	OUNCE
231B	⌛	HOURGLASS = hour (alchemy)
25A1	□	WHITE SQUARE = salt (alchemy)
2609	☉	SUN = gold (alchemy)
260C	☌	CONJUNCTION = day (alchemy)
263D	☽	FIRST QUARTER MOON = silver (alchemy) = Luna (alchemy)
263E	☾	LAST QUARTER MOON = silver, variant (alchemy) = Luna, variant (alchemy)
263F	☿	MERCURY = quicksilver, argentum vivum (alchemy)
2640	♀	FEMALE SIGN = Venus = copper (alchemy)
2641	♁	EARTH = antimony (alchemy)
2642	♂	MALE SIGN = Mars = iron (alchemy)
2643	♃	JUPITER = tin (alchemy)
2644	♄	SATURN = lead (alchemy) → XX30 ♿ saturn unbarred (alchemy)
2646	♆	NEPTUNE = bismuth (alchemy)

Unicode	Symbol	Description
2647	♇	PLUTO = copper ore (alchemy)
2648	♈	ARIES
2649	♉	TAURUS
264A	♊	GEMINI
264B	♋	CANCER
264C	♌	LEO
264D	♍	VIRGO
264E	♎	LIBRA
264F	♏	SCORPIO
2650	♐	SAGITTARIUS
2651	♑	CAPRICORN
2652	♒	AQUARIUS
2653	♓	PISCES
26A9	⚩	HORIZONTAL MALE WITH STROKE SIGN = magnesium, iron (alchemy and older chemistry)
26B9	⚹	SEXTILE = sal-ammoniac (alchemy) → 002A * asterisk → XX38 ⯭ sal-ammoniac

Table 2. Preliminary Unicode Alchemical Symbol Table

Unicode	Symbol	Description
Substances		
XX01	🜻	AQUAFORTIS
XX02	🜾	AQUA-VITAE = spiritus vini
XX03	🝀	AQUA-VITAE 2
XX04	🜺	AQUA REGIA = balneum arenae (sand bath), lapis armenus (Armenian stone)
XX05	🝁	AQUA REGIA 2
XX06	⊕	CIRCLED CROSS = aes viride (green copper) → 2295 circled plus
XX07	🜍	WHITE DOWN-POINTING TRIANGLE WITH BAR = earth, sulfur → 2641 ♁ earth (astrology, astronomy)
XX08	▽	WATER → 25BD white down-pointing triangle
XX09	🜁	AIR
XX0A	△	FIRE
XX0B	🜰	QUINTESSENCE
XX0C	⊖	SALT → 2296 circled minus
XX0D	🜍	SULFUR = brimstone
XX0E	🜎	PHILOSOPHER'S SULFUR
XX0F	🜏	BLACK SULFUR = sulphur nigra
XX10	🜔	SALT OF ANTIMONY = cinnabar
XX11	🜩	REGULUS OF ANTIMONY
XX12	🜔	REGULUS OF ANTIMONY 2
XX13	🜴	REGULUS
XX14	🝆	REGULUS 2
XX15	🜵	REGULUS 3

Unicode	Symbol	Description
XX16		REGULUS 4
XX17		REGULUS OF IRON = regulus martis
XX18		TARTAR = lixivium (lye)
XX19		TARTAR 2
XX1A		OIL
XX1B		SPIRIT
XX1C		TINCTURE
XX1D		GUM
XX1E		WAX = cera
XX1F		NITER = marcasite → 29B6 circled vertical bar
XX20		VITRIOL
XX21		VITRIOL 2
XX22		CROCUS OF IRON = crocus martis
XX23		CROCUS OF IRON 2
XX24		CROCUS OF COPPER = crocus veneris, aes ustum
XX25		CROCUS OF COPPER 2
XX26		COPPER ANTIMONIATE = crocus of copper, crocus veneris, lapis haematites
XX27		POWDER = pulvis
XX28		CALX = calcinare
XX29		QUICK LIME = calx viva
XX2A		TUTTY = tutia, aes viride
XX2B		CAPUT MORTUUM
XX2C		MERCURY SUBLIMATE
XX2D		MERCURY SUBLIMATE 2
XX2E		MERCURY SUBLIMATE 3
XX2F		MERCURY SUBLIMATE 4

Unicode	Symbol	Description
XX30		VINEGAR = distilled vinegar
XX31		VINEGAR 2 = crucible; acid; distill; atrament; vitriol; red sulfur; borax; wine; alkali salt; mercurius vivus, quick silver → 002b plus
XX32		VINEGAR 3
XX33		SCEPTER OF JOVE
XX34		SATURN UNBARRED = lead → 2644 ♄ saturn
XX35		TRIDENT = crocus of iron
XX36		CADUCEUS
XX37		CINNABAR
XX38		SAL-AMMONIAC
XX39		SAL-AMMONIAC 2 = vinegar of antimony
XX3A		LOADSTONE = magnes
XX3B		SOAP = sapo → 25CA lozenge
XX3C		URINE → 22A1 squared dot operator
XX3D		HORSE DUNG = fimus equinus
XX3E		ALUM
XX3F		ARSENIC
XX40		ARSENIC 2
XX41		AURIPIGMENT
XX42		REALGAR
XX43		REALGAR 2
XX44		ASHES = cineres
XX45		POT ASHES = cineres clavellati, alumen
XX46		BORAX
XX47		BORAX 2

Unicode	Symbol	Description
XX48		BORAX 3
XX49		MARCASITE 2
XX4A		ALKALI = sal alkali
XX4B		ALKALI 2
XX4C		ROCK SALT = sal gemmae
XX4D		ROCK SALT 2
XX4E		BRICK = latera
XX4F		POWDERED BRICK = later cibratus, farina laterum
XX50		AMALGAM
XX51		STRATUM SUPER STRATUM
XX52		STRATUM SUPER STRATUM 2
XX53		IRON ORE
XX54		SALT OF COPPER ANTIMONIATE
XX55		SUBLIMATE OF SALT OF COPPER
XX56		SUBLIMATE OF SALT OF COPPER 2
XX57		SUBLIMATE OF SALT OF ANTIMONY

Processes

XX58		SUBLIMATION
XX59		SUBLIMATE = arsenic
XX5A		PRECIPITATE
XX5B		DISTILL = sublimate
XX5C		DISSOLVE
XX5D		DISSOLVE 2 = water, aqua
XX5E		PURIFY → 260B descending node
XX5F		PUTRIFACTION

Apparatus

XX60		ALEMBIC
XX61		BATH OF MARY = balneum mariae
XX62		BATH OF VAPORS = balneum vaporis
XX63		CRUCIBLE = tigellum
XX64		CRUCIBLE 2
XX65		CRUCIBLE 3
XX66		CRUCIBLE 4
XX67		CRUCIBLE 5
XX68		RETORT
XX69		RETORT 2

Time

XX6A		HOUR
XX6B		NIGHT
XX6C		DAY-NIGHT
XX6D		MONTH =mensis → 22A0 squared times

Measures

XX6E		HALF DRAM = drachma semis
XX6F		HALF OUNCE = uncia semis

Table 3. Newton's Ore and Sublimation Symbols

🜲°	IRON ORE 2 <U+2642 U+00B0>
🜲⃘	IRON ORE 3 <U+2642 U+00B0>
♀°	COPPER ORE <U+2640 U+00B0>
⚿°	IRON-COPPER ORE <U+26A5 U+00B0>
♄°	LEAD ORE <U+2644 U+00B0>
♄⃘	LEAD ORE 2 <U+2644 U+00B0>
🜴°	TIN ORE <U+2643 U+00B0>
🜴⃘	TIN ORE 2 <U+2643 U+00B0>
🜘⃘	BISMUTH ORE <U+2646 U+00B0>
🜘	BISMUTH ORE 2 <U+2646 U+00B0>
♁°	ANTIMONY ORE <U+2641 U+00B0>
⚹♁	SUBLIMATE OF ANTIMONY <U+2641 U+002A>
⚹⃘♁	SUBLIMATE OF ANTIMONY 2 <U+2641 U+002A >
⚹♀	SUBLIMATE OF COPPER <U+2640 U+002A >
⚹⟙	STARRED TRIDENT <U+XX35 U+002A >

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