

THE RE-CLASSIFICATION OF MERCURY COMPOUNDS CONTAINING NITROGEN, CARBON, PHOSPHOUS AND SILICON.

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Classical mineral classification of minerals containing halides of mercury and nitrogen have been placed under the Class of Halides (Strunz 8th edition, Nickel-Strunz 10th edition, Dana 8th edition, Hey's CIM Reference). However, current structural data have shown that the classification of mercury-nitrogen phases are better represented by the structural building blocks of the mineral and not by the anions balancing the charge of the structure.

Recent structural results of such minerals as comancheite and ccuk-10 have shown that the fundamental building block of these minerals is the tetrahedron containing a nitrogen atom in the center surrounded by mercury atoms at the four vertices. The corresponding halogens, typically Cl, I, and Br, are often disordered and their function is to provide electrical charge balance to the structure and not a structural element. Minerals of this type often have structures consisting of nets, which provide a variety of open channels and rings that host the halides. The mineral terlinguacreekite, $\text{Hg}^{2+}_3\text{O}_2\text{Cl}_2$, has been shown to contain nitrogen instead of oxygen in the structure, and therefore is considered a nitride of mercury. Structure evaluation of this mineral has been difficult by the twinning effect of the structure.

My original mineral classification has for years included these mercury-nitrogen halides under the Class heading of Halides. However, to be consistent with modern structural data, I have re-classified these minerals under GROUP F of the ELEMENTS Class where other nitrides occur. In addition to the several nitrides of mercury occurring in Nature, a single carbide of mercury associated with terlinguacreekite, has recently been discovered during a mineralogical examination of the closed McDermitt mercury mine in Humboldt County, Nevada. The structure of this new phase is currently under study.

Below is my new classification section containing the nitrides of mercury with sections for the possibility of both silicides and phosphides of mercury, if they should be discovered.

GROUP F	MERCURY-BEARING CARBIDES, NITRIDES, SILICIDES, PHOSPHIDES (COVALENT CHARGED-FRAMEWORK)
TYPE A	CARBON-CENTERED TETRAHEDRA

SERIES A	MCDUK-7	
AFAAA	MCDUK-7	$(\text{Hg}_4\text{C})\text{OCl}_2$
TYPE B	NITROGEN-CENTERED TETRAHEDRA	
SERIES A	CCUK-10, orth/Amam. Structure consists of a complex ordered three-dimensional net of $[\text{Hg}^{2+}\text{-N-Hg}^{2+}]$ linkage arranged so as to create a rather open structure consistent with the anti-cristobalite structure. The N atoms are tetrahedrally coordinated by 4 Hg^{2+} atoms; these N-centered tetrahedra then link up by corner-sharing at their Hg vertices in a series of 5, 6, 7 and 8-membered rings that form a continuous open net. There are three additional Hg^{2+} atom positions residing within larger cavities of the net that are coordinated by a group of disordered halogens, sulfur and OH. The remaining halogens (I, Cl, Br) are distributed throughout the net to complete the charge balance.	
AFBAA	CCUK-10	$\text{Hg}^{2+}_3[\text{Hg}^{2+}_2\text{N}]_{18}(\text{Cl}_{11.0}\text{I}_{10.18}\text{Br}_{0.73}\text{S}_{0.58}(\text{OH})_{1.81})_{\Sigma 24.30}$
SERIES B	TERLINGUACREEKITE, orth (mon)? Structure being determined. Chemistry is now considered to be a nitride of Hg by Raman spectroscopy (in process).	
AFBBA	TERLINGUACREEKITE	$\text{Hg}^{2+}\text{-N-Cl,Br}$
SERIES C	MOSESITE SERIES, cub/$F\bar{4}3m$. Isostructural with $\text{Hg}_2\text{NOH}\cdot 2\text{H}_2\text{O}$ and its salts, the structure has a cubic cristobalite-type configuration of Hg_2N^+ groups. Anionic exchange is achieved through the relative open channels of the structure. The halogens achieve the charge balance of the structure.	
AFBCA	MOSESITE-(Cl)	$\text{Hg}_2\text{N}(\text{Cl,I,Br})\cdot \text{H}_2\text{O}$
AFBCB	MOSESITE-(I) (ccuk-18)	$\text{Hg}_2\text{N}(\text{I,Cl,Br})\cdot \text{H}_2\text{O}$
AFBCC	MOSESITE-(Br)(proposed)	$\text{Hg}_2\text{N}(\text{Br,Cl,I})\cdot \text{H}_2\text{O}$
SERIES D	COMANCHEITE, orth/Pnnm. The structure consists of nine crystallographically distinct Hg^{2+} cations, each of which is coordinated by two N^{3-} anions to form near-linear $\text{N}_3\text{-Hg}^{2+}\text{-N}_3$, (OH) ⁻ and (NH ₂) ⁻ anions, and there is a small amount of $[\text{Hg-Hg}]^{2+}$ dimer. In addition, there are eight crystallographically distinct halogen sites, three of which are completely occupied by Cl ⁻ , and five of which are occupied by both Cl ⁻ and Br ⁻ . The principal anion, N^{3-} , shows a strong preference for tetrahedral coordination by Hg^{2+} , which results in a strongly bonded three-dimensional $\{-\text{Hg}^{2+}\text{-N}^{3-}\}$ framework. This framework is both interrupted and contains large interstices that incorporate additional Hg^{2+} cations, a very small amount of $[\text{Hg}^+\text{-Hg}^+]^{2+}$ dimer and additional anion species, O^{2-} , (OH) ⁻ and (NH ₂) ⁻ , that coordinate Hg^{2+} .	
AFBDA	COMANCHEITE	$\text{Hg}^{2+}_{55}\text{N}^{3-}_{24}(\text{OH,NH}_2)_4(\text{Cl}_{24.5}\text{Br}_{9.5})$
SERIES E	KLEINITE, trig/$C6_3/mmc$. Structure similar to that of mosesite, but with an anti-tridymite framework with large channels // [0001] that accommodate anionic groups and water.	
AFBEA	KLEINITE	$[\text{Hg}_2\text{N}]_3^+\text{Cl}_2\text{S}_{0.5}\cdot \text{H}_2\text{O}$
AFBEB	CCUK-19	Hg-N-Cl, I, Br
TYPE C	SILICON-CENTERED TETRAHEDRA	
TYPE D	PHOSPHOUS-CENTERED TETRAHEDRA	