New Mineral Names*

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IN THIS ISSUE

This New Mineral Names has entries for eight new minerals, including ferrotochilinite, ferrovalleriite, fluoro-potassic-pargasite, guidottiite, hydroxylchondrodite, hydroxymanganopyrochlore, lahnsteinite, and mariniskite. These new minerals have been published in Clays and Clay Minerals, Doklady Akademii Nauk (Doklady Earth Sciences), Mineralogical Magazine, and Zapiski Rossiyiskogo Mineralogicheskogo Obshchestva (Proceedings of the Russian Mineralogical Society).

FERROTOCHILINITE*


An iron analogue of tochilinite 6FeS·5Mg(OH)2–ferrotochilinite, ideally 6FeS·5Fe(OH)2, has been reported from the Oktyabr’skoye mine, Oktyabr’skoye Cu-Ni-PGM deposit, Talnakh, Norilsk district, Krasnoyarskiy Kray, Russia. Fe-containing tochilinite (with Mg > Fe) is described from various localities. The Fe-rich tochilinite with Fe dominant over Mg in brucite-like layers was mentioned without detailed description in carbonate chondrites (Barber et al. 1983; Tomeoka and Buseck 1983; Mackinnon and Zolenskiy 1984). At the Oktyabr’skoye mine, the mineral is found in the cavities of the pentlandite-mooihoekite-cubanite ore with minor magnetite and chalcopyrite. Ferrotochilinite overgrows the light-green platy crystals of Fe-rich chlorite-type phyllosilicate that incrusts the cavities. Rarely, it overgrows hexagonal platy crystals of ferrovalleriite. This sequence is thought to be of low-temperature hydrothermal origin. The mineral forms flattened by (001) mostly split and curved 

Mohs hardness is less then 1; VHN2 is 13 (11–15) kg/mm2. Cleavage by (001) is mica-like perfect. Individuals are flexible, inelastic. The density could not be measured; Dd 93.67 g/cm3. In reflected light, ferrotochilinite is gray, with the hue changing from bluish (R1) to pale beige (R2); distinctly (ΔR = 2.6% at 589 nm) bireflectant. Anisotropy is distinct, with gray-bluish to yellowish-beige rotation colors. No internal reflections were observed. Reflectance values were measured between 400 and 700 nm in 20 nm interval. The values for (COM) wavelengths [R1, R2, % (nm)] are: 11.6, 11.4 (470), 11.2, 12.4 (546), 11.1, 13.6 (589), 11.0, 15.5 (650). IR spectrum was obtained using FTIR spectrometer with 4 cm−1 resolution. It is similar to those of tochilinite and ferrovalleriite. IR absorption bands (cm−1, w = weak, s = shoulder) are: 3515sh, 3457 (stretching vibrations OH group presence only) 1.03, total 98.84. The empirical formula calculated on the basis of 6 S atoms is: Mg 0.02 (0–0.03), Fe 61.92 (60.1–62.6), Ni 0.03 (0–0.11), Cu 0.09 (0–0.21), S 19.45 (18.3–20.0), O 16.3 (15.7–17.1), H (calculated considering OH group presence only) 1.03, total 98.84. The empirical formula calculated on the basis of 6 S atoms is: Mg 0.02, Fe 61.92, Ni 0.03, Cu 0.09, S 19.45, O 16.3.

The unit-cell parameters are: a = 5.463(5), b = 15.865(17), c = 10.825(12) Å, β = 93.7(1)°, V = 936 Å3, Z = 2. The quality of the ferrotochilinite crystals did not allow its structure refinement. The name reflects that ferrotochilinite is a structural analogue (based on chemical, X-ray, and IR data similarities) of tochilinite, with Fe2+ instead of Mg2+.

* All minerals marked with an asterisk have been approved by the IMA CNMMC.
† For a complete listing of all IMA-validated unnamed minerals and their codes, see http://pubsites.uws.edu.au/ima-cnmmc/.
of Mg in the hydroxide part. The mineral and the name have 
been approved by the IMA CNMNC (IMA 2010-080). The type 
specimen is deposited in Fersman Mineralogical Museum of 
Russian Academy of Sciences, Moscow. D.B.

REFERENCES CITED
characterized phases in C2M carbonaceous chondrite meteorites. Nature, 

FERROVALLERIITE*
I.V. Pekov, E.V. Sereda, V.O. Yapaskurt, Yu.S. Polekhovsky, S.N. 
Britvin, and N.V. Chukanova (2012) Ferrovalleriite, 2(Fe,Cu) 
S·1.5Fe(OH)₃: validation as a mineral species and the new 
English abstract).

Ferrovalleriite, ideally 2(Fe,Cu)S·1.5Fe(OH)₃, a layered 
hydroxide-sulfide of the valleriite group, the analogue of val-
leriite with Fe dominance over Mg in the hydroxide part, has 
been approved along with its name by the IMA CNMNC (IMA 
2011-068) as a valid mineral species. The mineral was mentioned 
repeatedly from the different Cu-Ni-PGM deposits of the Norilsk 
region, Krasnoyarsk Krai, Siberia, Russia, under the names: 
“valleriite-type mineral” (Harris et al. 1970), “Fe-valleriite” 
(Emelina et al. 1982; Organova 1989), “ferroan valleriite” 
(Spiridonov and Gritsenko 2009). However, it was never sub-
mitted to the IMA CNMNC and the mineral was mentioned as 
UM1970-24:S:CuFe at the IMA CNMNC list of valid unnamed 
minerals (update 2012-01).

The complex study of this mineral on the specimens from three 
different associations (all thought to be of low-temperature 
hydrothermal origin) at the Oktyabr’sky Mine, Talnakh, No-
rilsk area, was undertaken to validate the status of the mineral 
species. The ferrovalleriite holotype specimen was found in 
cavities and fractures of the pentlandite-mooshoekite-cubanite 
ore with minor magnetite and chalcopyrite. It overgrows, along 
with small octahedral magnetite crystals, the platy crystals of 
Fe-rich chlorite-type phyllosilicate that incrusts the cavities. 
Hexagonal plates of ferrovalleriite (up to 0.3 × 2 mm) are 
overgrown by another recently discovered hydroxide-sulfide, 
ferrotochilinite. The second association in the less than 1 cm 
cavities in mooshoekite-cubanite ore with magnetite includes 
small rhodochrosite crystals. Mn-bearing ferrovalleriite forms 
here aggregates of thin distorted or curved flakes (up to 0.1 × 2 
mm), which fill up to half of the cavities’ volume. In fractures 
of the same ore, where ferrovalleriite is associated with Fe-rich 
chlorite, hibbingite, and rust-colored lepidocrocite pseudomorphs 
(presumably after ferrotochilinite), the mineral forms hexagonal 
or round plates (up to 0.2 × 5 mm) split similar to hematite “roses” 
or chaotic open aggregates and crusts up to 2 cm in size. In all 
cases, the main habit form is {001}. When fresh, the mineral 
is dark bronze-colored, metallic, with a black streak. It rather 
soon turns nearly black, dull or tarnishes to iridescent or golden-
brown. The Mohs hardness is about 1; VHN₀₋₀ = 35 (29–39) kg/
mm². Cleavage by (001) is mica-like perfect. Individuals are 
flexible, inelastic. The density could not be measured; D_calc = 
3.72 g/cm³. In reflected light, ferrotochilinite is pleochroic with 
color change from yellowish to gray; bireflectance is moderate 
(ΔR = 7.6% at 589 nm). Anisotropy is strong, with bluish gray 
to yellowish beige rotation colors. No internal reflections were 
observed. Reflectance values were measured between 400 and 
700 nm in 20 nm intervals. The values for (COM) wavelengths 
[Rₑ, Rₛ (% [nm])] are: 15.0, 16.6 (470); 14.8, 20.5 (546); 14.7, 22.3 
(589); 14.5, 24.1 (650). IR spectrum was obtained using a FTIR 
spectrometer with 4 cm⁻¹ resolution. It is similar to those of to-
chilinite and ferrotochilinite. IR absorption bands (cm⁻¹) are: 3537 
(stretching vibrations O – H), 1022weak (stretching vibrations 
Si–O of an admixed chlorite-type mineral), 708 (bending vibra-
tions Fe²⁺⋯O–H), 580 (resonance mode of the stretching and 
bending vibrations of Fe³⁺⋯O and Fe⁵⁺⋯O–H, respectively), 481 
(stretching vibrations Fe³⁺⋯O). No bands due to H₂O molecules 
were observed. The difference of IR spectra of sulfide-hydroxides 
and Fe-Cu sulfides with H₂O molecules is discussed. The aver-
age of 6 microprobe (EDS and WDS) analyses of the holotype 
 specimen [wt% (range)] is: Al 0.10 (0–0.2), Mn 0.03 (0–0.10), 
Fe 45.31 (44.1–46.8), Ni 0.07 (0–0.2), Cu 18.29 (17.0–19.4), S 
20.37 (19.2–21.8), O 15.62 (14.7–16.8), H₃O₀.98, total 100.77. 
The empirical formula calculated on the basis of 2 S atoms, is 
A₂₃₋₂Fe₂₅Cu₀₁₀S₃(OH)₃.₂₃ = (Fe₁₉₆Cu₉₆)₂₂₅S₃(Cu₁₃Fe₂₅Al₁₀)₀.₂₁₇ 
(OH)₃.₀₅. The Fe²⁺/Fe³⁺ ratio was calculated based on charge 
balance. Single-crystal X-ray diffraction pattern shows that the 
mineral is metrically hexagonal with unit-cell parameters a = 
3.829(3), c = 33.5(1) Å, V = 425 Å³, Z = 3. Space group is R₃m, 
R₃m, or R₃2. The quality of the ferrovalleriite crystals did not 
allow its structure refinement. The structure of ferrovalleriite 
was described as incommensurate (Organova 1989), two sub-
lattices are present: (1) “sulfide sub-lattice”, with space group 
R₃m, R₃m, or R₃2; unit-cell parameters: a = 3.792(2), c = 34.06(3) Å, V = 
424 Å³, and (2) “hydroxide sub-lattice”, with space group P₃₅m, 
P₃₁m, or P₃2₁; parameters: a = 3.202(3), c = 11.35(2) Å, V = 
100.8 Å³. Along with aforementioned main polytype with three-
layered (R-cell, Z = 3) sulfide block, the holotype ferrovalleriite 
contains the modification with one-layer (P-cell, Z = 1) sulfide 
block [sulfide sub-lattice with space group P₃₅m, P₃₁m, or 
P₃2₁]; parameters: a = 3.789(4), c = 11.35(1) Å, V = 141(5) 
Å³. Powder X-ray diffraction data were obtained using a single-
crystal diffractometer by Gandolfi method (MoKα radiation). The 
strongest lines of the powder diffraction pattern [d(obs) (Å) (l₁, l₂, l₃); 
hkl₁, hkl₂, hkl₃)] are: 11.42 (18; 003, 001, 001P), 5.69 (100; 006, 
002, 0002P), 3.784 (17; 009, 003, 003P), 3.268 (58; 101, –, 100P), 
3.163 (36; –, –, 101P), 2.765 (14; –, 100, –), 2.473 (15; –, –, 012, 
103P), 2.143 (19; –, –, 104P), 1.894 (34; 110, 006, 006P), 1.871 
(113; –, –, 111P), where hkl₁, hkl₂, hkl₃ are related to sub-lattices for 
sulfide and hydroxide layers, respectively, and hkl₉ to the minor 
presence of P-cell polytype, which is also known for valleriite. 
It is suggested to write the chemical formula for valleriite as 
2(Fe,Cu)S·1.5[(Mg₁₋ₓAlₓ)O(H₂O)₃₋ₓ] to keep Z an integral number. The 
data on Fe-Mg-Al-Mn isomorphism in brucite-like structure 
modules of the valleriite-group minerals are discussed as well as 
geochemical and crystallochemical reasons for the rarity in nature 
of Fe (over Mg) sulfide-hydroxides. The fragment of one of the 
co-type specimens is deposited in the Fersman Mineralogical 
Museum of Russian Academy of Sciences, Moscow, Russia. D.B.
**NEW MINERAL NAMES**

Fluoropolytassic-pargasite*  

Fluoropolytassic-pargasite (IMA 2009-091), ideally $\text{K}^+\text{Ca}_2(\text{Mg,Al})_2\text{Si}(\text{Al})\text{O}_2\text{F}_6$, is a new amphibole species found in a skarn in the Tranomaro area, Fort Dauphin region, Madagascar. Fluoropolytassic-pargasite occurs in millimetric/centimetric crystals associated with diopside, phlogopite, apatite, calcite, anthophylite, and titane. Crystals are brittle, with Mohs hardness of 6.5 and a splintery fracture, perfect {110} cleavage, and no observable parting. Fluoropolytassic-pargasite is brownish-black vitreous with a pale-gray streak and is non-fluorescent under UV radiation. Its measured and calculated densities are 3.46 and 3.151 g/cm$^3$, respectively. In plane-polarized light it is pleochroic, $X =$ colorless to very pale gray, $Y =$ very pale gray, $Z =$ colorless; $X^\prime < Y < Z < Z^\prime$ (in $\beta$ obtuse), $V \parallel b$, $Z^\prime > c = 31.4^\circ$ (in $\beta$ acute). It is biaxial positive, with $\alpha = 1.638(2)$, $\beta = 1.641(2)$, $\gamma = 1.647(3)$ (in $\beta$ obtuse), and $\alpha = 9.911(3)$, $\beta = 105.55(2)^\circ$, $c = 10.595(2)^\circ$, $V = 913.2(4)$ Å$^3$, space group $C2/m$. It was ascertained that the measured density is 3.33 g/cm$^3$. Electron microprobe analyses (EDS), yielded the average composition (in wt%): MgO 5.65±0.79, MnO 34.21±0.84, Fe$_2$O$_3$ 25.97±0.22, SiO$_2$ 21.23±0.44, total 87.06 wt%, corresponding to the empirical formula (determined anhydrously, based on seven oxygen atoms): (Mn$_{1.5}$Fe$_{2.5}$Mg$_{0.54}$Mn$_{0.03}$Ti$_{0.03}$)$(Fe^{3+}_{0.69}Al^{3+}_{0.31})$O$_2$(OH)$_2$. Thermal analysis suggested a dehydroxylation temperature of 535 °C, a decomposition/re-crystallization temperature of 722 °C, and weight loss ($=\text{H}_2\text{O}$ loss) of 9.4%. Transmission electron microscope analysis was performed and HRTEM images showed stacking disorder within Group D serpentine polytypes (i.e., with a regular alternation of the occupancy of octahedral sets within each layer along the stacking, but affected by disorder of the layer displacements of 0 and $a/2$, with $a$ referred to the orthorhombic cell). Crystals of guidottiite from N’chw’aning 2 show mostly the 2H$_{2}$ polytype (i.e., ordered, no layer displacement), with minor amounts of the 2H$_{3}$ polytype (i.e., with alternating + and −b/3 displacement). The six strongest observed X-ray powder diffraction lines (Gandolfini camera, graphite-monochromatized CuKα radiation) are $d$ in Å ($I_{obs}$ %; $hkI$): 3.133 (100; 310), 3.270 (55; 240), 2.809 (47; 330), 8.413 (45; 110), 2.698 (39; 151), 3.374 (31; 131), 2.934 (29; 211), and 1.647 (29; 461). The refined unit-cell parameters, based on the power diffraction pattern, are: $a = 9.911(2)$, $b = 17.972(3)$, $c = 5.322(2)$ Å, $V = 105.55(2)^\circ$, $V = 913.2(4)$ Å$^3$, space group $C2/m$. The single-crystal structure refinement of fluoropolytassic-pargasite was performed on the basis of intensity data collected with a Philips PW1000 4-circle diffractometer (graphite-monochromated MoKα radiation), to $R_{int} = 0.024$ and 2078 unique reflections. Refined unit-cell parameters based on the single-crystal diffraction pattern are: $a = 9.910(4)$, $b = 17.9739(4)$, $c = 5.3205(1)$ Å, $V = 105.53(4)^\circ$, $V = 913.11(6)$ Å$^3$. The holotype sample of fluoropolytassic-pargasite was obtained from the mineral collection of Renato and Adriana Pagano (Cinisello, Milan, Italy), where it is specimen no. 7074B. Fragments of the holotype specimen are deposited at the Museo di Mineralogia di Scienze della Terra of the University of Pavia with the code 2009-02. G.D.G. and F.C.

**GUIDOTTITE***


Guidottiite (IMA 2009-061), ideally (Mn$_{1.4}$Fe$_{3.0}$)$(SiFe^{3+})_3$O$_6$(OH)$_2$, is a new serpentinite-group mineral found in the N’chw’aning 2 mine, Kalahari manganese field, Republic of South Africa. The mineral appears to form from hydrothermal solutions, and occurs with hematite, chlorite, leucophoenicite, caryopilite, barite, rhodochrosite, shigatae, and geagate. Guidottiite is analogous to cronstedtite (i.e., an Fe-rich trioctahedral 1:1 layer silicate of the serpentinite group with an ideal end-member formula (Fe$_2$O$_3$)$(SiFe^{3+})_3$O$_6$(OH)$_2$). Crystallites of guidottiite, ranging in size up to ~3 mm, are vitreous and black, with perfect {001} platy cleavage. They are optically near opaque, with average refraction index of 1.765 and variable extinction on the (001). The Mohs hardness is about 4. The calculated density is 3.236–3.291 g/cm$^3$ (on the basis of a slightly different composition), the measured density is 3.33 g/cm$^3$. Electron microprobe analyses (EDS), yielded the average composition (in wt%): Mg$_O$ 5.65±0.79, MnO 34.21±0.84, Fe$_2$O$_3$ 25.97±0.22, SiO$_2$ 21.23±0.44, total 87.06 wt%, corresponding to the empirical formula (determined anhydrously, based on seven oxygen atoms): (Mn$_{1.4}$Fe$_{3.0}$Mg$_{0.54}$Mn$_{0.03}$Ti$_{0.03}$)$(Fe^{3+}_{0.69}Al^{3+}_{0.31})$O$_2$(OH)$_2$. Thermal analysis suggested a dehydroxylation temperature of 535 °C, a decomposition/re-crystallization temperature of 722 °C, and weight loss ($=\text{H}_2\text{O}$ loss) of 9.4%. Transmission electron microscope analysis was performed and HRTEM images showed stacking disorder within Group D serpentine polytypes (i.e., with a regular alternation of the occupancy of octahedral sets within each layer along the stacking, but affected by disorder of the layer displacements of 0 and b/3, where b is referred to the orthorhombic cell). Crystals of guidottiite from N’chw’aning 2 show mostly the 2H$_2$ polytype (i.e., ordered, no layer displacement), with minor amounts of the 2H$_3$ polytype (i.e., with alternating + and −b/3 displacement). The six strongest observed X–ray powder diffraction lines (Gandolfini camera, graphite-monochromatized MoKα radiation) are $d$ in Å ($I_{obs}$ %; $hkI$): 7.21 (100; 002), 3.543 (50; 004), 2.568 (39; 112), 1.982 (26; 115), 2.381 (25; 113, 006), 2.706 (14; 111). The powder diffraction pattern was indexed on the basis of single-crystal X-ray diffraction data (Bruker diffractometer, monochromatized MoKα radiation). The R values were 0.072 and 0.108 from 656 unique reflections $I > 3\sigma(I)$. Results showed that the crystal actually has a random interstratification of 2H$_2$ and 2H$_3$. The mineral name honors Charles V. Guidotti (1935–2005) of the University of Maine, U.S.A., for his many contributions.
to phyllosilicate mineralogy. A specimen of guidottite (NMMNH 174879) has been deposited in the Smithsonian Institution, Washington, D.C., U.S.A. G.D.G. and F.C.

**HYDROXYCHONDROIDITE**


A new member of humite group, OH analogue of chondrodite, hydroxychondroideite, ideally Mg$_2$SiO$_3$(OH)$_2$, has been discovered in the Perovskitovaya Kop’ (perovskite pit) on the western slope of the Chuvashskie Mountains in the Zlatoust region, South Ural, Russia. It was found in the contact zone between magnesium skarn and host marble in calcite-clinochlore aggregates with dolomite, tremolite, diopside, andradite–grossular, magnetite, perovskite, hydroxyxclinohumite, and titanite. Hydroxychondroideite forms coarse tabular or lens-like individuals up to 0.5 × 1.5 × 1.5 cm and their intergrowths up to 2 cm. The mineral is reddish-brown, vitreous, with a pale-yellow streak. The Mohs hardness is 6. Hydroxychondroideite is brittle, fracture is uneven and cleavage is not observed. Parting by {001} is due to thin polysynthetic twinning. The measured density is 3.21 (1), $D_{calc} = 3.183$ g/cm$^3$. The mineral is optically biaxial (+), $\alpha = 1.662(3)$, $\beta = 1.669(2)$, $\gamma = 1.688(2)$, $2V_{meas} = 80(10)^\circ$, $2V_{calc} = 63^\circ$; $Z = b$. It is strongly pleochroic: $X =$ brown; $Y =$ light brown with grayish green tint; $Z =$ pale, grayish greenish brown; $X > Y > Z$. The IR spectrum noticeably differs from that of chondrodite. The main absorption bands (cm$^{-1}$) are: 3290 (O–H stretching vibrations); 1080sh, 1020sh, 993, 901, 853, 830sh (Si–O stretching vibrations); 779w, 738 (O–Si–O bending and Mg–O stretching vibrations); 614, 541, 476, 445sh, 416 (vibrations of octahedral A···O–H, B···O–H, C···O–H), 720sh, 569, 420 (vibrations of octahedral B containing groups). The main absorption bands of IR spectrum (cm$^{-1}$) are: 3290 (O–H stretching vibrations); 1080sh, 1020sh, 993, 901, 853, 830sh (Si–O–H stretching vibrations); 779w, 738 (O–Si–O and Mg···O–H bending vibrations); 614, 541, 476, 445sh, 416 (O–Si–O bending and Mg···O–H stretching vibrations). The average of 11 microprobe analyses (EDS and WDS) is [wt% (range)]: MgO: 52.74 (52.2–54.3); FeO: 1.51 (1.3–1.7); TiO$_2$: 3.39 (2.75–3.89), La$_2$O: 0.92 (0.67–1.15); NiO: 0.47 (0.4–0.6); CuO: 0.23 (0.17–0.28); Fe$_2$O$_3$: 0.29 (0.25–0.35); MnO: 0.37 (0.33–0.41); Cr$_2$O$_3$: 0.12 (0.1–0.2); CoO: 0.12 (0.1–0.15). The refined parameters of the monoclinic cell are: $a = 7.8847(12)$, $b = 4.7235(8)$, $c = 10.2869(15)$ Å, $\beta = 109.19(1)^\circ$, $V = 361.83(16)$ Å$^3$. The space group is $P2_1/c, Z = 2$. Polysynthetic twinning and blocky character of crystals did not allow refining the crystal structure to a satisfactory value of the $R$ factor using a single crystal. The structure of hydroxychondroideite was confirmed by the Rietveld method using the model of its synthetic analog structure as the starting model. Hydroxychondroideite is isostructural with chondrodite and differs from the latter by the OH predominance in the F site. Based on similarity to synthetic analogue and IR data, it is suggested that in hydroxychondroideite H atoms occupy two positions and probably form bifurcated hydrogen bonds. The mineral and its name were approved by the IMA CNMNC (IMA 2010-019). The type specimen is deposited in the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, Russia. D.B.

**REFERENCES CITED**


**HYDROXYMANGANOPOYROCHLORITE**


A new member of pyrochlore supergroup (A$_B$X$_Y$), hydroxyman-gano-pyrochlore, with Mn$^{2+}$ dominance in $A$ site and OH dominance in $Y$ site, has been discovered in an active pumice quarry in the Dellen near the city of Mendig, Laacher See area, Eifel volcanic region, Rheinland-Pfalz, Germany. The mineral was found in small mafic intrusive cavities in sanidine in a late pneumatolytic association that includes sanidine, nosean, biotite, tephroite, jacobsite, and spinellides of the gahnite–hercynite framework. No bands due to B and C containing groups or H molecules were detected. The empirical formula calculated for (OH+OH+E) = 11 is (Mg$_{32.5}$Ti$_{3.0}$Fe$_{0.7}$)$_{24.0}$Si$_{60}$O$_{129}$H$_{11.2}$O$_{22.0}$. Finds of chondrodite with low to near zero F content were previously mentioned without its complete description in similar to Perovskitovaya Kop’ association at Bol’shaya Shishimskaya Kop’ of the same Zlatoust region, South Ural, Russia (Boroneman-Starynkevich, I.D. 1964) in kimbrite of the Buell Park, Arizona, U.S.A. (Aoki et al. 1964) and in garnet pyroxenite from Dabie Shan, China (Hermann et al. 2007). In all those localities the mineral was enriched with Ti. Powder X-ray diffraction data were obtained using a single-crystal diffractometer by Gandolfi method (MoK$_\alpha$ radiation). The strongest lines of the powder diffraction pattern $D_{calc}$ (Å) ($I_{obs}$%, $hkl$) are: 4.87 (24, 102), 3.568 (26, 102, 202), 3.479 (26, 111), 3.023 (36, 217), 2.763 (37, 113), 2.673 (37, 013), 2.621 (44, 211), 2.518 (59, 213), 2.293 (35, 021, 31T), 2.260 (74, 31T, 212, 114), 1.740 (100, 32T, 222, 12ç). The refined parameters of the monoclinic cell are: $a = 7.8847(12)$, $b = 4.7235(8)$, $c = 10.2869(15)$ Å, $\beta = 109.19(1)^\circ$, $V = 361.83(16)$ Å$^3$. The space group is $P2_1/c, Z = 2$. Polysynthetic twinning and blocky character of crystals did not allow refining the crystal structure to a satisfactory value of the $R$ factor using a single crystal. The structure of hydroxychondroideite was confirmed by the Rietveld method using the model of its synthetic analog structure as the starting model. Hydroxychondroideite is isostructural with chondrodite and differs from the latter by the OH predominance in the F site. Based on similarity to synthetic analogue and IR data, it is suggested that in hydroxychondroideite H atoms occupy two positions and probably form bifurcated hydrogen bonds. The mineral and its name were approved by the IMA CNMNC (IMA 2010-019). The type specimen is deposited in the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, Russia. D.B.
The average (range) of six microprobe analyses (H₂O by gas chromatography of ignition products at 1200 °C) is: FeO 3.87 (3.12–4.57), CuO 1.68 (1.35–1.90), ZnO 57.85 (56.44–59.54), SO₃ 15.83 (15.40–16.33), H₂O 22.3, total 101.53 wt%. The empirical formula based on 13 O is: (Zn₂₋₂Fe₂₋₂Cu₁₋₂)₁₋₂(S₅₋₅O₈)(OH)₆·3H₂O; the idealized formula is Zn₂(SO₄)(OH)₆·3H₂O. Powder X-ray diffraction data were obtained by Gandolfi method using single-crystal diffractometer (MoKα radiation). The strongest lines of the powder diffraction pattern: d(obs) (Å) (I₀₀₀, hkl) are: 2.969 (100, 202), 2.569 (40, 400), 2.358 (12, 331), 1.816 (47, 440), 1.548 (40, 622), 1.481 (14, 444), 1.178 (14, 622). The parameter of cubic unit-cell is: a = 10.2523(2) Å, V = 1077.62(4) Å³, Z = 8. The hydroxymanganopyrochlore structure is similar to those of other pyrochlore supergroup members. According to the data obtained, Mn is the predominant element in the A site and Nb in the B site. The mineral was named for its composition in accordance with current nomenclature of pyrochlore supergroup. Both the mineral and the name were approved by the IMA CNMNC (IMA 2012-005). The type specimen is deposited in the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, Russia. D.B.

**Lahnsteinite***


A new mineral lahnsteinite was discovered at the dump of the Friedrichsseege Mine, near the city of Lahnstein in the Lahn valley, Ems District, Rhineland-Palatinate (Rheinland-Pfalz), Germany. It formed in the oxidation zone of a complex (Pb, Zn, Cu, Ag, Fe) deposit, where the ore is related to quartz-siderite structures with 

Ce₁₋₀.Laₐ₋₀.Νd₁₋₀.Μ₀₋₀.Τ₁₋₀.Ι₂₋₀.Ο₀₋₀.Ο₂₋₀.F₁₋₀. The simplified formula is (Μ₆₋₆,Τ₆₋₆)₃(Nb₂₋₂,Ti₁₋₁)₂Σ₁₋₀.Ο₄₋₀.Ο₂₋₀.F₁₋₀. Powder X-ray diffraction data were obtained by Gandolfi method (MoKα radiation) using a single-crystal diffractometer. The strongest lines of the powder diffraction pattern: d(obs) (Å) (I₀₀₀, hkl) are: 2.969 (100, 222), 2.569 (40, 400), 2.358 (12, 331), 1.816 (47, 440), 1.548 (40, 622), 1.481 (14, 444), 1.178 (14, 622). The parameter of cubic unit-cell is: a = 10.2523(2) Å, V = 1077.62(4) Å³, Z = 8. The lahnsteinite crystal structure is based on brucite-like sheets consisting of edge-sharing Zn octahedra, in six-membered rings with vacant central octahedra. Zn and S tetrahedra are attached to both sides of the octahedral sheet, with S tetrahedra sharing an apex with Zn octahedra while Zn tetrahedra are attached at both sides of the vacant central octahedral. Chemically and topologically identical and electrically neutral sheets are displaced relative to each other by 1/2 a, and linked only by the hydrogen bonds of water molecules. The distribution of H₂O groups in the space between the sheets is disordered. Linkage by weak hydrogen bonds leads to packing defects in the sheet sequence, which explains large Rₚ factor while the structure model is consistent in the cationic composition, thermal parameters, interatomic distances, and bond-balance sum on anions. The crystallochemical formula of lahnsteinite is [Ⅷ(Zn,Fe,Cu)₄(OH)₆][ⅥZn(OH)₆(H₂O)] [SO₄] (H₂O), where the layers of Zn octahedra and isolated Zn and S centered tetrahedra are given in square brackets. The mineral is almost identical to the synthetic zinc hydroxide sulfate trihydrate 3Zn(OH)₂·ZnSO₄·3H₂O (space group Pᵀ) and is chemically and structurally similar to namuwite (Zn,Cu)₆(SO₄)(OH)₆·4H₂O (which does not have sheets displacement in its structure) and osakite (Zn,Cu)₆(SO₄)(OH)₆·3H₂O. It is also structurally related to schulenbergite, ktenasite, christelite, and gordanite. The mineral was named after the city of Lahnstein near the type locality. Both the mineral and its name have been approved by the IMA CNMNC (IMA 2012-002). Type specimen is deposited in the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, Russia. D.B.

**Marinskite***


A new mineral marinskite, ideally BeCr₄O₈, the chromium analogue of chrysoberyl, has been discovered at the Marinskoye (Malyshkove) Be deposit, Ural Emerald Mines, Middle Urals, Russia, and named for its type locality. That locality is also famous as an important emerald deposit and type locality of alexandrite, a
Cr-bearing color change variety of chrysoberyl. The new mineral was found in the chromitite lens in serpentinites. Chromitite rocks consist of brown to black Al-rich chromite I grains, randomly distributed in the matrix of brown, grainy aggregates of chromite II (with low-Al content), which replaces chromite I. Chromitite rocks are crosscut by randomly oriented veinlets containing greenish-gray fluorophlogopite and bluish-green Cr-muscovite. Mariinskite forms isometric anhedral grains less then 1 mm in chromite II. Less common are euhedral zonal grains or pseudohexagonal chrysoberyl-type twins. Mariinskite often contains inclusions of fluorophlogopite and eskolaite and is associated with zonal tourmaline of dravite-fluordravite composition. The origin of the new mineral is thought to be metasomatic. Mariinskite is dark green, vitreous, with a pale green streak. The fracture is conchoil. The Mohs hardness is 8.5; VHN \(_{100}\) = 1725 (1681–1771) kg/mm\(^2\). \(D_{\text{meas}}\) = 4.25(2), \(D_{\text{obs}}\) = 4.25 g/cm\(^3\). No fluorescence under UV light or electron beam was observed. In transmitted light, the mineral is emerald-green, strongly pleochroic: \(Z\) = emerald-green, \(Y\) = yellow-green, \(X\) = greenish-yellow; \(Z \gt Y \gt X\). Mariinskite is optically biaxial (+); \(a = 2.05\) (1), \(b = 2.09\) (3), \(c = 2.15\) (1), 2\(V\) = 80° (10), 2\(V_{\text{obs}}\) = 80.5°. The absorption spectrum in the visible range shows wide absorption bands with maximums at 430 and 600 nm. The strongest IR absorption bands (cm\(^{-1}\)) are: 935, 700 (stretching vibrations of BeO, tetrahedra), 614, 534 [stretching vibrations of (Cr,Al)O\(_3\) octahedra]. The average of 92 microprobe (EDS and WDS) analyses [wt% (range)] is: BeO 16.3 (15.4–17.2), Al\(_2\)O\(_3\) 23.89 (15.24–29.73), Cr\(_2\)O\(_3\) 58.67 (52.99–65.39), Fe\(_2\)O\(_3\) 0.26 (0.11–0.40), V\(_2\)O\(_3\) 0.26 (0.10–0.39), TiO\(_2\) 0.61 (0.08–1.80), total 99.98. The empirical formula, calculated on the basis of 4 O, is Be\(_{1.03}\)(Cr\(_{1.12}\)Al\(_{0.74}\)Ti\(_{0.01}\)Fe\(_{0.01}\)V\(_{0.01}\))\(_{2}\)\(_{x}\)\(_{O}_{4}\). X-ray powder diffraction data were obtained using Debye-Scherrer and Guinier cameras (CuK\(_\alpha\) filtered radiation). The strongest lines of the powder diffraction pattern [\(d_{\text{obs}}\) (Å) (I obs\%, hkl)] are: 4.08 (40, 101), 3.31 (90, 111), 2.629 (50, 301), 2.434 (50, 220), 2.381 (40, 311), 2.139 (60, 401), 1.651 (100, 222). Mariinskite is orthorhombic, space group \(Pnma\). The unit-cell parameters are: \(a = 9.727\) (3), \(b = 5.619\) (1), \(c = 4.499\) (1) Å, \(V = 245.9\) Å\(^3\), \(Z = 4\). No crystal suitable for crystal structure refinement was found. By the X-ray data, optical, and other physical properties, mariinskite is identical to synthetic BeCr\(_3\)O\(_4\), for which structure is known. The mineral and its name were approved by the IMA CNMNC (IMA 2011-057). The type specimens are deposited in the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, and in the Ural Geological Museum, Ekaterinburg, Russia. D.B.