

complexes, makes them important indicators of the type of association of alkaline rocks and the conditions of their formation.

A12-19: Kimzeyite from aposkarn rodingites, Wiluy River, Republic Sakha -Yakutia (Russia)

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Zirconian schorlomite and kimzeyite garnets described in the geological literature are usually associated with rocks of the ultrabasic-alkaline complexes (carbonatite) or with basic magmatic rocks. Minerals of the kimzeyite-schorlomite series occur in aposkarn metarodingites in the Wiluy deposit of achtarandite, grossular and wiluite on the Wiluy River, Republic Sakha-Yakutia. The metarodingites of the deposit comprise unusually stratified rodingites that are part of a metasomatically-altered, volcano-sedimentary rock mass belonging to the Tungus Series, the formation of which was connected with the formation of Siberian trapps.

Garnets form metacrystals in rodingite-like, fine-grained rock consisting of tabular pseudomorphs of vesuvianite and hydrogarnet after melilite. The spaces between the pseudomorphs is filled by serpentine and chlorite. Relict metacrystals related to an early skarn stage are represented by wiluite, garnet and high-Al diopside. Perovskite and apatite occur as accessory minerals.

Garnets of the schorlomite ($\text{Ca}_3\text{Ti}_2\text{R}^{3+}_2\text{SiO}_{12}$)-kimzeyite ($\text{Ca}_3\text{Zr}_2\text{R}^{3+}_2\text{SiO}_{12}$) series are preserved as relicts in the central parts of an idiomorphic crystal of rhombododecahedron habit exhibiting complex zoning. The central part of the crystal is composed of Zr-schorlomite-morimotoite. Zr and Ti contents are constant with variation ranging from 0.48 to 0.52 a.p.f.u. and from 0.72 to 0.83 a.p.f.u. respectively. A reaction zone with increased Zr content varying from 0.78 to 0.82 a.p.f.u. (often Zr>Ti) follows. This zone is succeeded in turn by a homogeneous zone comprising Zr-bearing, Ti-andradite. The last zone overgrowing the metacrystal is composed of grossular with a proportion of the andradite molecule.

Most of the fine-grained, Zr-containing garnets are characterised by a different type of zoning. The composition of these garnets changes from kimzeyite (with a Zr content ranging up to 0.83 a.p.f.u) - Zr-schorlomite in the centre through Zr-containing Ti-andradite to Fe-grossular in the marginal zone. The high concentration of divalent elements in these garnets indicates a significant presence of morimotoite ($\text{Ca}_3\text{Ti}^{4+}\text{R}^{2+}_2\text{Si}_3\text{O}_{12}$) and Zr-morimotoite ($\text{Ca}_3\text{Zr}^{4+}\text{R}^{2+}_2\text{Si}_3\text{O}_{12}$).

The discovery of schorlomite-kimzeyite series garnets in what are unusual aposkarn rodingites is unique. Firstly, the garnet described is a new genetic type of kimzeyite-Zr-schorlomite series garnet. Secondly, garnets are the main reservoir of Zr and Ti in rocks of this type. Thirdly, garnets with such a high content of ZrO₂ (19.02 wt.%) have not previously been described from Russia.

A12-20: Shirokshinite, $\text{K}(\text{NaMg}_2)\text{Si}_4\text{O}_{10}\text{F}_2$: first mica with octahedral Na (Kola Peninsula, Russia).

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Shirokshinite is a late mineral found within an alkaline pegmatite of the Kirovskii Mine (Kukisvumchorr Mt., Khibiny massif). The new species has been approved by the IMA. Minerals associated to shirokshinite are: microcline, kuptelskite, aegirine, galena, natrolite, lorenzenite, calcite, remondite-(Ce), donnayite-(Y), mckelveyite-(Y). Colourless, biaxial (-), α 1.526(1), β 1.553(2), γ 1.553(2); chemical composition: $\text{K}_{0.90}(\text{Na}_{0.94}\text{Mg}_{1.97}\text{Fe}_{0.09}\text{Mn}_{0.01}\text{Ti}_{0.01})_{\Sigma 3.02}(\text{Si}_{3.98}\text{Al}_{0.02})_{\Sigma 4.00}\text{O}_{9.995}\text{F}_{2.01}$. From single-crystal X-ray diffractometry a 5.269(2), b 9.092(11), c 10.198(3) Å, β 100.12(7)°, $C2/m$ have been obtained.

The crystal structure of shirokshinite has been refined to R 0.13 for 715 observed reflections. In spite of a high R value (due to poor crystallinity), the refined number of electrons (e_{ref}) shows that the octahedral sites M cannot contain cations lighter than Na. The dimension of the site M1, larger than that of M2, and e_{ref} show that these two sites are occupied by Na and Mg, respectively. Thus, the ratio Na/Mg found by chemical analysis is confirmed by the structure refinement

IR spectroscopy played an important role in the characterization of the new mica. The IR spectrum of shirokshinite is unique but similar to that of tainiolite: the presence of the heavier Na⁺ instead of Li⁺ causes up to 40 cm⁻¹ shifts of some bands towards low frequencies.

It was reported an indirect evidence for octahedral Na in micas, but shirokshinite is the first reported mica with Na dominant in an octahedral site. Both octahedral and interlayer Na is instead quite common in the layer titanosilicates; the structure of these minerals is based on mica-like layers where rows of Si-tetrahedra are replaced by rows of 6(or 5)-co-ordinated Ti.

After the recent first description of a 2O mica polytype, the Khibiny massif becomes the type locality for two micas.

A12-21: Roedderite(?) from the Nagy Hill, Tarpa, NE Hungary: a problem with the classification based on electron microprobe analyses in the roedderite-merrhueite subgroup of the milarite group

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The Nagy Hill is an outcrop of a large early Sarmatian dacite body. Roedderite occurs at the contact of dacite and agglomerate, where it can be found on the joint surfaces and in the fissures of dacite as well as in agglomerate together with epidote. Roedderite forms greyish blue and blue, hexagonal, short prismatic crystals up to 1.5 mm, with forms {0001}, {1010}, {1120}, {2130}, {1012} and {1122}.

In the literature the chemical formula of roedderite is written as (Na, K)₂(Mg, Fe)₅Si₁₂O₃₀, while the formula of merrhueite is (K, Na)₂(Fe, Mg)₅Si₁₂O₃₀. The line is drawn at Fe/(Fe + Mg) = 0.5 between roedderite and merrhueite. The mineral is roedderite, if the above value is <0.5, but it is merrhueite, if >0.5. However, this approach is incorrect because the general structural formula of the minerals of the milarite group is ⁶A₂⁹B₂¹²C¹⁸D⁴T(2)₃⁴T(1)₁₂O₃₀, so the formula of roedderite end-member should be written as ^BNa^CK^AMg₅^{T(2)}Mg₅^{T(1)}Si₁₂O₃₀. Similarly, the formula of merrhueite end-member is NaKFe₂Fe₃Si₁₂O₃₀. Thus there are two unnamed, theoretical end-members of the roedderite-merrhueite subgroup, namely UN1 with composition NaKFe₂Mg₃Si₁₂O₃₀, and UN2, NaKMg₂Fe₃Si₁₂O₃₀.

Based on electron microprobe analyses the composition of Tarpa roedderite is the following: (K_{0.94}Na_{0.74})_{Σ=1.68} (Mg_{3.69}Fe_{1.24}Mn_{0.09}Al_{0.07})_{Σ=5.09} Si_{12.02} O₃₀. Because both of Mg and Fe can occupy the A and T(2) sites, we can not give the structural formula of Tarpa mineral. If the total iron goes to the T(2) sites, then the Tarpa mineral is roedderite, but if the total iron occupies the A sites, then our mineral represents the UN1 species. Merely based on electron microprobe analyses it is impossible to determine the distribution of Mg and Fe between A and T(2) sites.

A12-22: Duhamelite discredited

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Reinvestigation of duhamelite, originally described as Cu₄Pb₂Bi(VO₄)₂(OH)₃·8H₂O, has demonstrated that it is not a valid independent mineral species. Analyses of the type material and of additional samples by means of electron microprobe, X-ray powder and single-crystal diffractometry including structure refinements, and transmission electron microscopy have shown that duhamelite belongs to the adelite-descloizite-group, M1M2(XO₄)(OH) and corresponds to a bismuth- and calcium-bearing mottramite, [PbCu(VO₄)(OH)]. The chemical formula is (Pb,Bi,Ca)Cu(VO₄)(OH,O). Bi³⁺ is an essential component; however, Pb²⁺ dominates over Bi³⁺ with a strong variation in the Pb:Bi ratio. All duhamelite samples contain small but distinct Ca²⁺ contents; some also contain minor amounts of As⁵⁺ and Si⁴⁺.