Gittinsite is a new calcium zirconium silicate mineral found in pegmatitic lenses in a regionally metamorphosed agpaitic syenite complex at the Kipawa River, Villedieu Township, Témiscamingue County, Québec. It forms chalky, grey-white fine-grained intergrowths with apophyllite that are commonly associated with vlasovite. Other associated minerals are eudialyte, fluorite, graphite, calcite, apatite, opal, agrellite, clinoamphibole, mosandrite, pectolite, microcline, and thorite. Colorless in thin section, gittinsite is biaxial negative with 2V = 30(10)°, n₁ 1.720(2), n₂ 1.736(2), n₃ 1.738(2); extinction on (010) being nearly parallel to the X direction, at an angle of 5–10° to elongation (c). Electron-microprobe analysis gave CaO 18.4, ZrO₂ 40.3, SiO₂ 40.8, total 99.5%. The empirical formula calculated for 7 oxygen atoms is Ca₉.9₈Zr₀.₀₈Si₉.₉₈O₇, or ideally, CaZrSi₉O₁₇. Monoclinic, a 6.878(4), b 8.674(4), c 4.697(2) Å, ß 101.74(4)°, Z = 2, group C2/m; the gittinsite is the analogue of the thorite (PDF 19–1125). The calculated density is 3.624.

**Mots-clés:** gittinsite, nouvelle espèce, silicate de calcium et de zirconium, complexe syénitique agpaitique, rivière Kipawa, Québec, propriétés optiques, analyse à la microsonde, diffraction X.

**INTRODUCTION**

In a description of the occurrence of vlasovite Na₂ZrSi₆O₁₇ in the alkalic complex at the Kipawa River, Villedieu Township, Témiscamingue County, Québec, Gittins et al. (1973) reported the presence of a new unnamed mineral found as an alteration along vlasovite cleavages. The mineral occurs as radiating sheaves of prismatic crystals 0.1–0.3 mm in length, too small to permit the determination of optical and physical properties; the authors did note that the crystals have very low birefringence. Electron-microprobe analyses showed that the mineral has an ideal composition of CaZrSi₉O₁₇.

In 1975 and 1976 the senior author collected suites of mineral specimens from the Kipawa River complex and noted the presence of some grey–white egg-shaped pods, up to 2 cm in size, in eudialyte-rich pegmatite lenses. In a preliminary study of this material (Plant & Roberts 1979), examination of thin sections of the pods, using incident light, revealed a eutectic-like fine-grained intergrowth of two phases with different reflectivities. Lenses of coarser grained material are present within the pods and consist of the same two phases found in the matrix (Fig. 1). Quantitative microprobe analysis showed that the higher reflectivity phase is stoichiometric CaZrSi₉O₁₇ and that the second phase has a
Gittinsite has been named for Professor John Gittins, Department of Geology, University of Toronto, who first noted its occurrence and reported it as an unidentified mineral. Dr. Gittins is well known for his contributions to the petrology of alkalic rock complexes. Both the mineral and the mineral name were approved prior to publication by the Commission on New Minerals and Mineral Names, I.M.A. Holotype material is preserved in the National Mineral Collection, Geological Survey of Canada, Ottawa, under catalogue number 19558. Additional type material will be deposited with the Department of Mineralogy and Geology, Royal Ontario Museum, Toronto, and the Department of Geology, University of Toronto.

Gittinsite is a very rare mineral found in eudialyte-rich pegmatitic lenses in a regionally metamorphosed agpaitic syenite complex at the Kipawa River, Villedieu Township, Témiscamingue County, Québec, latitude 46°48'30" N, longitude 78°30'20" W. [Geographic coordinates given in Gittins et al. (1973), Aarden & Gittins (1974) and Gittins et al. (1976) are not accurate.] The geology of the complex is poorly known; descriptive summaries are given in Gittins et al. (1976) and Aarden & Gittins (1974).

Gittinsite is always found in intimate association with apophyllite and commonly, but not invariably, with vlasovite. Other closely associated minerals are eudialyte, fluorite, graphite, calcite, apatite and opal. The names “apophyllite” and “apatite” are used in the absence of complete analyses of these minerals. From their associations, they are likely to prove to be the fluorine-rich members of both groups. Occurring within the same pegmatite lens are aegirite, mosandrite, microcline, pectolite, thorite and clinoamphibole.

**Occurrence**

Gittinsite is a very rare mineral found in eudialyte-rich pegmatitic lenses in a regionally metamorphosed agpaitic syenite complex at the Kipawa River, Villedieu Township, Témiscamingue County, Québec, latitude 46°48'30" N, longitude 78°30'20" W. [Geographic coordinates given in Gittins et al. (1973), Aarden & Gittins (1974) and Gittins et al. (1976) are not accurate.] The geology of the complex is poorly known; descriptive summaries are given in Gittins et al. (1976) and Aarden & Gittins (1974).

Gittinsite is always found in intimate association with apophyllite and commonly, but not invariably, with vlasovite. Other closely associated minerals are eudialyte, fluorite, graphite, calcite, apatite and opal. The names “apophyllite” and “apatite” are used in the absence of complete analyses of these minerals. From their associations, they are likely to prove to be the fluorine-rich members of both groups. Occurring within the same pegmatite lens are aegirite, mosandrite, microcline, pectolite, thorite and clinoamphibole.
**Physical and Optical Properties**

Gittinsite occurs as fibrous to radiating masses intimately associated with apophyllite (Fig. 1), in round pods with an observed maximum dimension of 2 cm and along cleavage planes in vlasovite. No orientation relationship is apparent between gittinsite and vlasovite. The gittinsite–apophyllite intergrowths are chalky white in color with an estimated Mohs hardness of 3½–4. The maximum length of individual gittinsite fibres is approximately 0.1 mm, with a length-to-width ratio approaching 50:1. The small grain-size and intergrown nature of the mineral precluded the determination of most physical properties, including measured density. Calculated density for stoichiometric CaZrSi_2O_7 is 3.624 g/cm³.

In thin section with transmitted light, gittinsite is colorless. In reflected light, it has a noticeably higher reflectance than that of apophyllite. Gittinsite is colorless. In reflected light, it has a small grain-size and intergrown nature of the mineral precluded the determination of most physical properties, including measured density. Calculated density for stoichiometric CaZrSi_2O_7 is 3.624 g/cm³.

**Chemical Composition**

A chemical analysis was obtained with a Materials Analysis Company electron microprobe, operating with an accelerating voltage of 20 kV and a specimen current of 0.03 μA on zircon. Using synthetic diopside (for Ca and Si) and zircon (for Zr) as standards, analysis of gittinsite gave CaO 18.4, ZrO_2 40.3, SiO_2 40.8, total 99.5%, comparable with the analysis in Gittins et al. (1973). No other elements with atomic number greater than 10 were detected in energy-dispersive spectra. The empirical formula of gittinsite, calculated on the basis of 7 oxygen atoms, is Ca_{18.4}Zr_{40.3}Si_{40.8}O_{7} or, ideally, CaZrSi_2O_7.

**X-Ray Powder Diffraction**

X-ray single-crystal determinations could not be made because of the small grain-size. The X-ray powder-diffraction pattern, however, was successfully indexed on a monoclinic cell, giving a 6.878(4), b 8.674(4), c 4.697(2) Å, β 101.74(4)°, Z = 2 by analogy with thortveitite, Sc_2Si_2O_7 (PDF 19–1125). X-ray data are given in Table 1. None of the derived Miller indices violate the requirements of space group C2/m. Gittinsite is considered to be the CaZr analogue of thortveitite, in which two Sc atoms occupy different structural sites.

**Acknowledgements**

We are indebted to Ernest Nadon of Temiscamingue (Québec) and Ray Virtue of North Bay (Ontario) for providing some excellent specimens of the gittinsite–apophyllite associated with vlasovite. Special thanks are also due to Ernest Nadon, who graciously guided and assisted the senior author on his earlier expeditions to the Kipawa River occurrence.

**References**


Received January 1980, manuscript accepted February 1980.