STRONTIODRESSERITE, A NEW Sr-Al CARBONATE FROM MONTREAL ISLAND, QUEBEC

J. L. JAMBOR, A. P. SABINA, A. C. ROBERTS, B. D. STURMAN

Abstract

Strontiodresserite occurs as vitreous to silky white coatings, some of which are atoll-shaped, in a silicocarbonatite sill at St-Michel, Montreal Island, Quebec. The mineral is lath-like, with maximum dimensions 0.1×0.01×0.001 mm and is biaxial negative, 2V 42½(1)°, nα 1.510(4), nβ 1.583(2), nγ 1.595 (calc.), Y parallel to elongation, X normal to it and in the plane of the plates. Microprobe analyses gave CaO 2.83, 2.90, 2.60; SrO 24.07, 24.25, 24.75; Al2O3 29.16, 29.12, 29.12 wt. %, Ba and Pb not detected, average (Sr,Ca):Al=0.995:2.000. The mineral effervesces in dilute HCl and the similarity of its powder pattern with those of dundasite and dresserite suggests that strontiodresserite is (Sr,Ca)Al(CO3)2(OH)4.H2O. Strongest lines of the powder pattern are: 7.93(10), 4.39(8), 3.002(7), 5.99(6), 2.638(6), 3.55(4). Orthorhombic dimensions calculated from the pattern are: a 9.14, b 15.91, c 5.59 Å, D(calc.) 2.76 g/cm3 for the theoretical formula with Sr:Ca=4:1 and Z=4. The mineral formulae are: CaO 2.83, 2.90, 2.60; SrO 24.07, 24.25, 24.75; Al2O3 29.16, 29.12, 29.12 %, Ba and Pb not detected, average (Sr,Ca):Al=0.995:2.000. The mineral effervesces in dilute HCl and the similarity of its powder pattern with those of dundasite and dresserite suggests that strontiodresserite is (Sr,Ca)Al(CO3)2(OH)4.H2O. Strongest lines of the powder pattern are: 7.93(10), 4.39(8), 3.002(7), 5.99(6), 2.638(6), 3.55(4). Orthorhombic dimensions calculated from the pattern are: a 9.14, b 15.91, c 5.59 Å, D(calc.) 2.76 g/cm3 for the theoretical formula with Sr:Ca=4:1 and Z=4. The mineral formula is: (Sr,Ca)Al(CO3)2(OH)4.H2O. The mineral effervesces in dilute HCl and the similarity of its powder pattern with those of dundasite and dresserite suggests that strontiodresserite is (Sr,Ca)Al(CO3)2(OH)4.H2O. Strongest lines of the powder pattern are: 7.93(10), 4.39(8), 3.002(7), 5.99(6), 2.638(6), 3.55(4). Orthorhombic dimensions calculated from the pattern are: a 9.14, b 15.91, c 5.59 Å, D(calc.) 2.76 g/cm3 for the theoretical formula with Sr:Ca=4:1 and Z=4. The mineral formula is: (Sr,Ca)Al(CO3)2(OH)4.H2O.

Sommaire

La strontiodressérite se présente en enduits blancs d'éclat vitreux à soyeux, parfois en forme d'atoll, dans un filon-couche de silicocarbonatite à Ville St-Michel, dans l'Île de Montréal, Québec. Les cristaux sont en forme d'aiguilles aplatis dont les dimensions maximales sont: 0.1×0.01×0.001 mm. Ils sont biaxes négatifs avec 2V 42½(1)°, nα 1.510(4), nβ 1.583(2), nγ 1.595 (calc.), Y parallèle à l'allongement, X normal à celui-ci dans le plan de la plaquette. Les analyses à la microsonde indiquent: CaO 2.83, 2.90, 2.60; SrO 24.07, 24.25, 24.75; Al2O3 29.16, 29.12, 29.12 %, Ba et Pb n'ont pas été décelés, la moyenne du rapport (Sr,Ca):Al=0.995:2.000. Le minéral entre en effervescence dans HCl dilué, et son diagramme de poudre ressemble beaucoup à celui de la dundasite et à celui de la dressérite, ce qui fait penser que la strontiodressérite possède la formule chimique (Sr,Ca)Al(CO3)2(OH)4.H2O. Les raies les plus intenses du diagramme de poudre sont: 7.93 (10), 4.39 (8), 3.002 (7), 5.99 (6), 2.638 (6), 3.55 (4). Les dimensions orthorhombiques calculées à partir du diagramme sont: a 9.14, b 15.91, c 5.59 Å; D(calc.) 2.76 pour la formule théorique avec Sr:Ca=4:1 et Z=4, D(meas.) 2.71 g/cm3. Bien que la dundasite, la dressérite et la strontiodressérite soient chimiquement analogues, elles ne sont pas isostructurales.

Introduction

A silicocarbonatite sill at St-Michel, Montreal Island, Quebec, contains a variety of rare minerals (Sabina 1976). Among the four barium and strontium carbonates unique to this locality is the new mineral strontiodresserite. The name and mineral have been approved by the Commission on New Minerals and Mineral Names, IMA.

Properties

Strontiodresserite has been identified as sparse coatings on three hand specimens of the sill. One of the specimens has been deposited with the Royal Ontario Museum, Toronto (ROM M-34626), and another with the National Mineral Collection, Ottawa (13704). On all specimens the mineral is associated principally with abundant quartz and minor fine-grained dawsonite. Most strontiodresserite coats, and is partly interstitial to, aggregates of frosty quartz crystals, but some also occurs as atoll-shaped rings up to 3 mm in diameter. The cores of the atolls average about 2 mm in diameter and consist of quartz crystals; strontiodresserite is almost wholly confined to the margins of the cores.

All strontiodresserite appears as vitreous to silky aggregates of white, extremely fine-grained lath-like grains of maximum dimensions 0.1×0.01×0.001 mm. These are arranged radially around the cores of atolls. The laths are biaxial negative, 2V 42½(1)°, nα 1.510(4), nβ 1.583(2), and calculated nγ 1.595(4). Y is parallel to the lath elongation, and X is normal to it and in the thinnest, platy plane.

The optical properties indicate that strontiodresserite has orthogonal symmetry. Powder X-ray patterns of the mineral are slightly diffuse.

1CANMET, 555 Booth Street, Ottawa, K1A 0G1
2Geological Survey of Canada, 601 Booth Street, Ottawa, K1A 0E8
3Department of Mineralogy and Geology, Royal Ontario Museum, Toronto M5S 2C6
and are broadly similar to those of PbAl$_r$(CO$_3$)$_2$(OH)$_n$.H$_2$O (dundasite), and BaAl$_r$(CO$_3$)$_2$(OH)$_n$.H$_2$O (dresserite). Indexing of the strontiodresserite pattern was readily accomplished by comparison with the data for dundasite. The cell dimensions are $a = 9.14\,\text{Å}$, $b = 4.80\,\text{Å}$, and $c = 15.91\,\text{Å}$. These were derived by least-squares refinement of 14 diffraction lines between $d = 4.80$ and $1.866\,\text{Å}$. The indexed powder X-ray pattern is given in Table 1.

### COMPOSITION

A complete chemical analysis could not be obtained from the small amounts of strontiodresserite available. Cation percentages were determined from grains mounted in a polished section and analyzed with a microprobe operated at 20kV, 0.028 microamperes, and a defocused beam. The standards used were synthetic Al$_2$O$_3$, and natural calcite and strontianite. The last, obtained from Dr. A. G. Plant of the Geological Survey of Canada, contains 24.3 wt. % Ca. The three areas analyzed gave CaO 2.38, 2.90, 2.60; SrO 24.07, 24.25, 24.75; Al$_2$O$_3$ 29.16, 29.12, 29.12 wt. %. Ba and Pb were not detected, and S is less than 0.15 wt. %. The respective atomic ratios are (Sr,Ca):Al = 0.986:2.000, 1.001:2.000, and 0.998:2.000.

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<tr>
<th>Compound</th>
<th>Formula</th>
<th>Modifications</th>
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<tr>
<td>Strontiodresserite</td>
<td>SrAl$_r$(CO$_3$)$_2$(OH)$_n$.H$_2$O</td>
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<tr>
<td>Dresserite</td>
<td>PbAl$_r$(CO$_3$)$_2$(OH)$_n$.H$_2$O</td>
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<tr>
<td>Dundasite</td>
<td>BaAl$_r$(CO$_3$)$_2$(OH)$_n$.H$_2$O</td>
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Small amounts of strontiodresserite were heated in open tubes in horizontal furnaces, and were held at temperature for a minimum of 5 hours. The heated products were as follows: 100°C, strontiodresserite; 150°C and 200°C, strontiodresserite + phase X; 275°C, phase X; 550°C, amorphous. Crystalline products were obtained at higher temperatures (750 to 1080°C), but none could be identified. The powder X-ray patterns of phase X indicate that the compound is probably the strontium analogue of barium-bearing phase X which formed in the thermal breakdown of dresserite and hydrodresserite (Jambor et al. 1977).

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### COMPARISONS WITH DRESSERITE AND DUNDASITE

The crystal-structure study of dundasite by Cocco et al. (1972) showed that its formula is PbAl$_r$(CO$_3$)$_2$(OH)$_n$.H$_2$O, and its space group is Pbnm. Re-examination of dresserite by one of us (A.C.R.) has confirmed that weak $h0l$ diffraction spots with $h \neq 2n$ are present on precession films. Thus, dresserite lacks the n-glide present in dundasite, and the minerals are not isomorphous.

No single-crystal data are available for strontiodresserite, and its powder pattern is not amenable to the selection of a specific space group. However, strontiodresserite is elongate parallel to its optical Y axis, whereas dundasite and dresserite are elongate parallel to Z. It seems likely, therefore, that none of the minerals is isomorphic even though all have the same general chemical formula.

Chemical analyses of dundasite and dresserite indicate that these minerals absorb excess water beyond the formula requirement of 1H$_2$O. In the case of strontiodresserite, the slight diffuseness of its powder X-ray pattern may be a possible indication of structural disruption aris-
ing from non-stoichiometric proportions of CO₂ and H₂O. Nevertheless, some important properties of dundasite, dresserite, and strontiodresserite follow the same trends evident in anhydrous carbonates, namely, refractive indices and calculated densities progressively decrease in the sequence Pb→Ba→Sr, and cell volumes decrease in the sequence Ba→Pb→Sr.

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References


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