Hydroxymcglassonite-(K), K\textsubscript{Sr\textsubscript{4}}Si\textsubscript{8}O\textsubscript{20}(OH)\cdot8H\textsubscript{2}O, the first Sr-bearing member of the apophyllite group, from the Wessels mine, Kalahari Manganese Field, South Africa

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**ABSTRACT**

A new mineral species, hydroxymcglassonite-(K), ideally K\textsubscript{Sr\textsubscript{4}}Si\textsubscript{8}O\textsubscript{20}(OH)\cdot8H\textsubscript{2}O, has been found in the Wessels mine, Kalahari Manganese Field, Northern Cape Province, South Africa. It is granular (<0.05 mm), associated with meieranite, sugilite, aegirine, pectolite, and yuzuxiangite. The mineral is colorless, transparent with a white streak and a vitreous luster. It is brittle and has a Mohs hardness of 4.5–5.0; cleavage is perfect on {001} and no parting or twinning was observed. The measured and calculated densities are 2.60(3) and 2.614 g/cm\textsuperscript{3}, respectively. Optically, hydroxymcglassonite-(K) is uniaxial (+), with α = 1.555(5) Å, ε = 1.567(5) Å (white light), and absorption O > E. Hydroxymcglassonite-(K) is insoluble in water or hydrochloric acid. An electron microprobe analysis yielded an empirical formula (based on 13 non-H cations pfu) K\textsubscript{1.01}(Sr\textsubscript{2.99}Ca\textsubscript{1.03})\textsubscript{24.05}Si\textsubscript{7.99}O\textsubscript{20}(OH)\cdot8H\textsubscript{2}O, which can be simplified to K(Sr,Ca)\textsubscript{24}Si\textsubscript{8}O\textsubscript{20}(OH)\cdot8H\textsubscript{2}O.

Hydroxymcglassonite-(K) is tetragonal with space group P4\textsubscript{1}nmc and unit-cell parameters a = 9.0792(2) Å, c = 16.1551(9) Å, V = 1331.70(9) Å\textsuperscript{3}, and Z = 2. It is isostructural with hydroxyapophyllite-(K), KC\textsubscript{a}Si\textsubscript{8}O\textsubscript{20}(OH)\cdot8H\textsubscript{2}O, with Sr substituting for Ca. The crystal structure of hydroxymcglassonite-(K) is characterized by SiO\textsubscript{4} tetrahedra sharing corners to form (Si\textsubscript{8}O\textsubscript{20})\textsubscript{8–} sheets parallel to (001), which are connected by the K and B (Sr and Ca) cations, as well as hydrogen bonding. The K cation is coordinated by eight H\textsubscript{2}O groups, and the average K–O distance of 2.941(3) Å is shorter than that of 2.950(3)–2.975(3) Å in hydroxyapophyllite-(K) or fluorapophyllite-(K). The B cation is sevenfold-coordinated (4O + 2H\textsubscript{2}O + OH), and the average B–O distance of 2.522(3) Å is noticeably longer than that of 2.422–2.435 Å in hydroxyapophyllite-(K) or fluorapophyllite-(K). The Raman spectra of hydroxymcglassonite-(K) and hydroxyapophyllite-(K) are very comparable, especially in the O-H stretching region. The discovery of hydroxymcglassonite-(K), the first Sr-bearing mineral of the apophyllite group, implies that more Sr-bearing members of the group may be found in nature or synthesized in laboratories, but the possibility for an incomplete solid solution between hydroxyapophyllite-(K) and hydroxymcglassonite-(K), due to the size difference between Sr\textsuperscript{2+} and Ca\textsuperscript{2+}, cannot be ruled out.

**Keywords:** Hydroxymcglassonite-(K), apophyllite, new mineral, crystal structure, X-ray diffraction, Raman spectra

**INTRODUCTION**

A new mineral species, hydroxymcglassonite-(K), ideally K\textsubscript{Sr\textsubscript{4}}Si\textsubscript{8}O\textsubscript{20}(OH)\cdot8H\textsubscript{2}O, has been found in the Wessels mine, Kalahari Manganese Fields, Northern Cape Province, Republic of South Africa. It is named in honor of James (Jim) A. McGlasson, who has been interested in collecting minerals since age 10 and started field collecting after graduation from college. Jim earned his B.S. degree in geology at the New Mexico Institute of Mining and Technology and M.S. degree in geology at the Colorado School of Mines. A successful 45-year career as an exploration geologist, mine manager, and consultant has allowed him to obtain geological and mineralogical knowledge at many diverse deposits worldwide. Jim has served as the president of the Tucson Gem and Mineral Society, and he has been on the board of directors of the Friends of Mineralogy. With a strong belief that getting children interested in science of any kind, especially geology and mineralogy, is critical for our society and future, he has been actively and constantly involved in various educational programs for children and young students and has donated considerable amounts of mineral specimens for their interests/hobbies. Since his retirement in 2016, Jim has been a volunteer at the University of Arizona Mineral Museum and the mineralogy laboratory of the Department of Geosciences at the University of Arizona to continue his passion for minerals while contributing his knowledge and experience to help the society and other people. The new mineral and its name have been approved by the Commission on New Minerals, Nomenclature and Classification (CNMNC) of the International Mineralogical Association (IMA 2020-066). The co-type samples have been deposited at the University of Arizona Mineral Museum (catalog no. 22691) and the RRUFF Project (deposition no. R200004).

Hydroxymcglassonite-(K) is the first Sr-bearing mineral of the apophyllite group. This paper describes its physical and chemical properties and its crystal structure determined from single-crystal X-ray diffraction data.