Bultfonteinite

Bultfonteinite, originally **dutoitspanite**, is a pink, light-brown or colorless mineral with chemical formula $Ca_2SiO_2(OH,F)_4$. It was discovered in 1903 or 1904 in the Bultfontein mine in South Africa, for which the mineral is named, and described in 1932.

Description

Acicular crystals from the Wessels Mine in South Africa

Bultfonteinite is transparent and ranges from pale pink or light brown to colorless.[5] The mineral occurs as radiating prismatic acicular crystals and radial spherules up to 2 cm (0.79 in).[4]

Structure

The crystal structure of bultfonteinite consists of strips of $[Ca_4Si_2O_4]^{8+}$, that run along the 5.67 Å *c*-axis, held together by Ca–O–Ca, Ca–F–Ca, Ca–H_2O–Ca, and Ca–O–Si bonds. Silicon atoms occur in isolated tetrahedra and the calcium

Bultfonteinite

Bultfonteinite from Shijiangshan mine, China

General	
Category	Nesosilicates
Formula (repeating unit)	$Ca_2SiO_2(OH,F)_4$
IMA symbol	Bul[1]
Strunz classification	9.AG.80[2]
Dana classification	52.4.7.2[2]
Crystal system	Triclinic
Crystal class	Pinacoidal ($\bar{1}$) (same H-M symbol)
Space group	$P\bar{1}$
Unit cell	a = 10.99 Å, b = 8.18 Å c = 5.67 Å, α = 93.95° β = 91.32°, γ = 89.85°;[2] Z = 4
Identification	

atoms have seven-fold coordination, derived from a triangular prism with a seventh atom present on one of the square faces.[6]

Color	Colorless, pink, light brown
Twinning	Interpenetrating on {100} and {010}; polysynthetic
Cleavage	Good on {100} and {010}
Fracture	Conchoidal
Mohs scale hardness	4.5
Luster	Vitreous
Streak	White[2]
Diaphaneity	Transparent
Optical properties	Biaxial (+)
Refractive index	$n_\alpha = 1.587$ $n_\beta = 1.590$ $n_\gamma = 1.597$[2]
Birefringence	$\delta = 0.010$[2]
2V angle	70° (measured)
Dispersion	r > v; barely perceptible
Solubility	Soluble in hydrochloric acid[3]
References	[4]

History

In either 1903 or 1904, a miner discovered the first specimen of bultfonteinite on the 480-foot level of the Bultfontein mine in Kimberley, South Africa. The mineral occurred in a several-hundred-foot-tall horse of kimberlite-enclosed dolerite and shale fragments. The specimen, mistakenly thought to be natrolite, was given to Alpheus F. Williams. Several years later, additional samples were found by C. E. Adams in the nearby Dutoitspan mine and given to the MacGregor Museum in Kimberley.[7] Shortly before 1932, the mineral was found about 100 miles (160 km) to the southeast of Kimberley at the Jagersfontein Mine in Orange River Colony.[7][8]

After John Parry and F. E. Wright described the mineral afwillite in 1925, Williams recognized that his samples of bultfonteinite were not natrolite, but were likely a new mineral species. Chemical analysis by John Parry and crystallographic and optical determination by Wright proved it to be a new mineral.[9] The mineral was described by Parry, Williams, and Wright in 1932 and named *bultfonteinite*.[7] Their original description does not explicitly state the origin of the name, but it is presumably named after the mine in which it was discovered.[3] Earlier that year in his book *The Genesis of the Diamond*, Williams had called the mineral dutoitspanite, a name which was "apparently discarded".[8][10] When the International Mineralogical Association was founded, bultfonteinite was grandfathered as a valid mineral species.[2]

The type material is held in England at Cambridge University and the Natural History Museum in London.[4]

Occurrence

Bultfonteinite has been found in Australia, Botswana, Canada, Israel, Japan, Jordan, Russia, South Africa, and the United States.[2] The mineral was first located outside South Africa in the US state of California in 1955.[8] Bultfonteinite has been found in association with afwillite, apophyllite, calcite, natrolite, oyelite, scawtite, and xonotlite.[4]

At the type locality, the mineral occurred in a large structure of dolerite and shale fragments in a kimberlite pipe.[7] In Crestmore, California, bultfonteinite formed in the contact zone of thermally metamorphosed limestone.[4]

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