Burbankite $(Na, Ca)_3(Sr, Ba, Ce)_3(CO_3)_5$

Crystal Data: Hexagonal. *Point Group:* $6mm$. Long dihexagonal prismatic crystals with shallow pyramidal terminations, striated parallel [001], may be in fibrous spherical aggregates; anhedral granular, to 5 cm.

Physical Properties: *Cleavage:* On $\{10\bar{1}0\}$, distinct to imperfect. Hardness = 3.5–4 D(meas.) = 3.50–3.58 D(calc.) = 3.50–3.54 Piezoelectric.

Optical Properties: Transparent to translucent. *Color:* Colorless, grayish yellow, pale yellow, pink, pale greenish. *Luster:* Vitreous.
Optical Class: Uniaxial (–) $\omega = 1.616$–1.635 $\epsilon = 1.597$–1.623

Cell Data: *Space Group:* $P6_3mc$. $a = 10.41$–10.547 $c = 6.250$–6.520 Z = 2

X-ray Powder Pattern: Big Sandy Creek, Montana, USA.
2.630 (10), 3.034 (6), 5.26 (5), 3.719 (5), 2.145 (5), 1.754 (3), 1.662 (3)

Chemistry:

	(1)	(2)		(1)	(2)
CO_2	33.24	[33.17]	Dy_2O_3		0.08
Y_2O_3	< 0.03		Tb_2O_3	0.05	
La_2O_3	3.37		Yb_2O_3		0.10
Ce_2O_3	5.39	2.12	CaO	11.47	12.03
Pr_2O_3	0.46		SrO	25.08	32.35
Nd_2O_3	1.26	0.13	BaO	11.47	11.02
Sm_2O_3	0.14		Na_2O	8.34	8.30
Gd_2O_3	0.41		Total	100.68	[99.30]

(1) Big Sandy Creek, Montana, USA; by electron microprobe, corresponds to $(Na_{1.78}Ca_{0.89})_{\Sigma=2.67}(Sr_{1.60}Ba_{0.50}Ca_{0.46}La_{0.14}Ce_{0.22}Nd_{0.05}Pr_{0.02}Gd_{0.01})_{\Sigma=3.00}(CO_3)_5$. (2) Mont Saint-Hilaire, Canada; by electron microprobe, CO_2 from stoichiometry; corresponds to $(Na_{1.78}Ca_{1.07})_{\Sigma=2.85}(Sr_{2.07}Ba_{0.48}Ca_{0.35}RE_{0.10})_{\Sigma=3.00}(CO_3)_5$.

Occurrence: Typically an abundant accessory mineral in carbonatites; in an intrusive alkalic gabbro-syenite complex; may be authigenic.

Association: Ancylite, calkinsite, lanthanite, calcite, "biotite", barite (Big Sandy Creek, Montana, USA); ancylite, carbocernaite, calcite (Mont Saint-Hilaire, Canada).

Distribution: In the USA, from vermiculite prospects at the head of Big Sandy Creek, Rocky Boy's Indian Reservation, about 40 km east of Box Elder, Hill Co., Montana; in the Green River Formation, Utah and Wyoming. In Canada, at Mont Saint-Hilaire, and in the Miron quarry, Montreal, Quebec; at Chipman Lake, Ontario. In the Qaqarssuk carbonatite, near Sukkertoppen, and the Grønnedal-Ika complex, Greenland. Found in Brazil, at Poços de Caldas, Minas Gerais. In Russia, on the Kola Peninsula, from the Vuoriyarvi carbonatite and Khibiny massifs, large crystals; at the Ozernyi carbonatite, southeastern Sakha; Arbarastakh carbonatite, Aldan; and the Nizhnesayanskii carbonatite, east Sayan; and in the Vishnevogorsk complex, Vishnevy-Ilmen Mountains, Southern Ural Mountains. From the Tajno massif carbonatites, 70 km north of Bialystok, Poland. In the Zeerust district, Transvaal, South Africa.

Name: Honors Wilbur Sweet Burbank (1898–1975), geologist of the U.S. Geological Survey.

Type Material: National Museum of Natural History, Washington, D.C., USA, 106843.

References: (1) Pecora, W.T. and J.H. Kerr (1953) Burbankite and calkinsite, two new carbonate minerals from Montana. Amer. Mineral., 38, 1169–1183. (2) Chen, T.T. and G.Y. Chao (1974) Burbankite from Mont St. Hilaire, Quebec. Can. Mineral., 12, 342–345. (3) Effenberger, H., F. Kluger, H. Paulus, and E.R. Wölfel (1985) Crystal structure refinement of burbankite. Neues Jahrb. Mineral., Monatsh., 161–170.