

Crystal Data: Hexagonal. *Point Group:* $\bar{3} 2/m$. As grains to 200 μm .

Physical Properties: *Cleavage:* n.d. *Fracture:* Uneven. *Tenacity:* n.d.
Hardness = n.d. D(meas.) = n.d. D(calc.) = 3.509

Optical Properties: Transparent. *Color:* Colorless. *Streak:* White. *Luster:* Vitreous.
Optical Class: Uniaxial (-). $\omega = 1.784(3)$ $\epsilon = 1.780(3)$

Cell Data: *Space Group:* $R\bar{3} m$. $a = 7.1300(1)$ $c = 26.2033(9)$ $Z = 3$

X-ray Powder Pattern: Hatrurim Basin, 5 km SE of Arad, Negev Desert, Israel.
3.565 (100), 2.762 (85), 3.301 (48), 3.201 (40), 6.010 (33), 8.734 (32), 3.066 (32)

Chemistry:	(1)
Na ₂ O	0.05
CaO	40.80
SrO	0.32
BaO	18.24
Al ₂ O ₃	0.03
Fe ₂ O ₃	0.10
SiO ₂	8.79
P ₂ O ₅	5.46
V ₂ O ₅	22.09
SO ₃	1.58
F	2.36
<u>-O = F₂</u>	<u>0.99</u>
Total	98.84

(1) Hatrurim Basin, 5 km SE of Arad, Negev Desert, Israel; average of 5 electron microprobe analyses supplemented by Raman spectroscopy; corresponding to (Ba_{0.98}Sr_{0.02}) $\Sigma=1.00$ (Ca_{5.99}Na_{0.01}) $\Sigma=6.00$ [(SiO₄)_{1.20}(VO₄)_{0.49}(PO₄)_{0.14}(SO₄)_{0.16}(AlO₄)_{0.01}] $\Sigma=2.00$ [(VO₄)_{1.5}(PO₄)_{0.49}(Fe³⁺O₄)_{0.01}] $\Sigma=2.01$ F_{1.02}.

Polymorphism & Series: Forms in the solid solution series BaCa₆[(SiO₄),(PO₄),(VO₄)]₄F.

Mineral Group: Nabimusaite group.

Occurrence: In paralava veins cutting gehlenite-rich pyrometamorphic rock formed by the combustion of organic matter in the sedimentary protolith or methane released by tectonic forces.

Association: Zadovite, gehlenite, pseudowollastonite, wollastonite, andradite-schorlomite, rankinite, magnesioferrite, kalsilite, fluorapatite, P-rich ellestadite, larnite, cuspidine, hematite, barioferrite, dorrite-khesinite, walstromite, barite, gurimite, fresnoite, delafossite, cuprite, vorlanite, perovskite, hexacelsian.

Distribution: From the Gurim Anticline, Hatrurim Basin, 5 km SE of Arad, Negev Desert, Israel.

Name: For the town, *Arad*, near where the first samples were collected.

Type Material: The Museum of Natural History, Bern, Switzerland (NMBE 42188).

References: (1) Galuskin, E.V., F. Gfeller, I.O. Galuskina, A. Pakhomova, T. Armbruster, Y. Vapnik, R. Włodyka, P. Dzierżanowski, and M. Murashko (2015) New minerals with a modular structure derived from hatrurite from the pyrometamorphic Hatrurim Complex. Part II. Zadovite, BaCa₆[(SiO₄)(PO₄)](PO₄)₂F and aradite, BaCa₆[(SiO₄)(VO₄)](VO₄)₂F, from paralavas of the Hatrurim Basin, Negev Desert, Israel. *Mineral. Mag.*, 79(5), 1073-1087. (2) (2016) *Amer. Mineral.*, 101, 1709 (abs. ref. 1).