

**Ulfanderssonite-(Ce)****Ce<sub>15</sub>CaMg<sub>2</sub>(SiO<sub>4</sub>)<sub>10</sub>(SiO<sub>3</sub>OH)(OH,F)<sub>5</sub>Cl<sub>3</sub>**

**Crystal Data:** Monoclinic. *Point Group:* *m*. As granular crystals to 300  $\mu$ m and aggregates to 2 mm.

**Physical Properties:** *Cleavage:* Indistinct on (001). *Tenacity:* Brittle. *Fracture:* Uneven. Hardness = 5-6 D(meas.) = n.d. D(calc.) = 4.972

**Optical Properties:** Translucent to transparent. *Color:* 'Flesh'-pink to colorless-grey; colorless in transmitted light. *Streak:* White. *Luster:* Vitreous to greasy.

*Optical Class:* Biaxial (-).  $n(\text{meas.}) > 1.8$   $n(\text{calc.}) = 1.82$   $2V(\text{meas.}) = 55(5)^\circ$

*Dispersion:* Moderate;  $r > v$ .

**Cell Data:** *Space Group:* *Cm*.  $a = 14.1403(8)$   $b = 10.7430(7)$   $c = 15.498(1)$   $\beta = 106.615(6)^\circ$   $Z = 2$

**X-ray Powder Pattern:** Malmkärä mine, Västmanland County, central Sweden. 2.948 (100), 2.923 (47), 2.660 (32), 3.524 (26), 1.7601 (25), 4.350 (21), 3.644 (21)

| <b>Chemistry:</b>              | (1)   | (2)   |                                | (1)    | (2)    |
|--------------------------------|-------|-------|--------------------------------|--------|--------|
| CaO                            | 2.26  | 1.65  | Eu <sub>2</sub> O <sub>3</sub> | 0.18   |        |
| FeO                            | 0.02  |       | Gd <sub>2</sub> O <sub>3</sub> | 1.15   |        |
| MgO                            | 1.97  | 2.37  | Dy <sub>2</sub> O <sub>3</sub> | 0.30   |        |
| P <sub>2</sub> O <sub>5</sub>  | 0.08  |       | Tb <sub>2</sub> O <sub>3</sub> | 0.10   |        |
| SiO <sub>2</sub>               | 19.13 | 19.43 | Y <sub>2</sub> O <sub>3</sub>  | 1.11   |        |
| La <sub>2</sub> O <sub>3</sub> | 11.87 |       | H <sub>2</sub> O               | [1.07] | 1.06   |
| Ce <sub>2</sub> O <sub>3</sub> | 30.98 | 72.41 | F                              | 1.09   | 1.12   |
| Pr <sub>2</sub> O <sub>3</sub> | 3.99  |       | Cl                             | 2.89   | 3.13   |
| Nd <sub>2</sub> O <sub>3</sub> | 17.14 |       | -O = (F, Cl)                   | 1.10   | 1.17   |
| Sm <sub>2</sub> O <sub>3</sub> | 2.81  |       | Total                          | 97.04  | 100.00 |

(1) Malmkärä mine, Västmanland County, central Sweden; average of 10 electron microprobe analyses supplemented by Fourier transform infrared spectroscopy and laser ablation-inductively coupled plasma-mass spectrometric analyses, H<sub>2</sub>O calculated from stoichiometry; corresponds to (Ce<sub>6.58</sub>Nd<sub>3.55</sub>La<sub>2.54</sub>Pr<sub>0.84</sub>Sm<sub>0.56</sub>Y<sub>0.34</sub>Gd<sub>0.22</sub>Dy<sub>0.06</sub>Eu<sub>0.04</sub>Tb<sub>0.02</sub>) $\Sigma=14.75$ Ca<sub>1.41</sub>Mg<sub>1.70</sub>Fe<sub>0.01</sub>Si<sub>11.11</sub>P<sub>0.04</sub>O<sub>43</sub>(OH)<sub>4.16</sub>F<sub>2.00</sub>Cl<sub>2.84</sub>. (2) Ce<sub>15</sub>CaMg<sub>2</sub>(SiO<sub>4</sub>)<sub>10</sub>(SiO<sub>3</sub>OH)(OH,F)<sub>5</sub>Cl<sub>3</sub>.

**Occurrence:** A primary mineral in metasomatic Fe-REE skarn mineralization of the Bastnäs-type.

**Association:** Västmanlandite-(Ce), bastnäsit-(Ce), phlogopite, talc, magnetite.

**Distribution:** From the Malmkärä mine, Bergslagen ore region, Norberg District, Västmanland County, central Sweden.

**Name:** Honors Ulf B. Andersson (b. 1960), a Swedish geologist-petrologist for his contributions to the understanding of the genesis of REE deposits of the Bastnäs type.

**Type Material:** Department of Geosciences, Swedish Museum of Natural History, Stockholm, Sweden (NRM 20010323).

**References:** (1) Holstam, D., L. Bindi, U. Hålenius, U. Kolitsch, and J. Mansfeld (2017) Ulfanderssonite-(Ce), a new Cl-bearing REE silicate mineral species from the Malmkärä mine, Norberg, Sweden. *Eur. J. Mineral.*, 29(6), 1015-1026. (2) (2018) *Amer. Mineral.*, 103, 1714-1715 (abs. ref. 1).