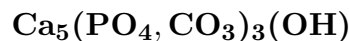


Carbonate-hydroxylapatite



©2001-2005 Mineral Data Publishing, version 1

Crystal Data: Hexagonal. *Point Group:* 6/*m*. Cryptocrystalline; as fibrous or laminated botryoidal crusts.

Physical Properties: *Cleavage:* Poor on {0001} and {10 $\bar{1}$ 0}. *Tenacity:* Brittle. Hardness = 5 D(meas.) = 2.9–3.2 D(calc.) = 2.87 (synthetic).

Optical Properties: Transparent to translucent. *Color:* Colorless, white, yellow, brown. *Luster:* Vitreous, earthy. *Optical Class:* Uniaxial (-). $\omega = 1.603$ $\epsilon = 1.598$

Cell Data: *Space Group:* $P6_3/m$ (synthetic). $a = 9.309$ $c = 6.927$ $Z = 2$

X-ray Powder Pattern: Synthetic $\text{Ca}_5(\text{PO}_4)_{1.5}(\text{CO}_3)_{1.5}(\text{OH})$. (ICDD 19-272). 2.78 (100), 2.68 (40), 3.46 (25), 2.231 (16), 1.929 (16), 1.838 (16), 3.04 (10)

Chemistry:	(1)
SO ₃	0.45
P ₂ O ₅	38.7
CO ₂	0.87
SiO ₂	1.13
La ₂ O ₃	0.14
Ce ₂ O ₃	0.37
CaO	54.8
SrO	0.32
F	0.93
Cl	0.20
OH	2.42
<u>-O = (F, Cl, OH)₂</u>	<u>1.57</u>
Total	98.76

(1) The Kaiserstuhl, Germany; by electron microprobe and coulometric analysis, average of six analyses, (OH)¹⁻ calculated for stoichiometry; corresponding to $(\text{Ca}_{4.97}\text{Sr}_{0.02}\text{Ce}_{0.01})_{\Sigma=5.00}[(\text{PO}_4)_{2.77}(\text{CO}_3)_{0.10}(\text{SiO}_2)_{0.10}(\text{SO}_3)_{0.03}]_{\Sigma=3.00}[(\text{OH})_{0.72}\text{F}_{0.25}\text{Cl}_{0.03}]_{\Sigma=1.00}$.

Mineral Group: Apatite group.

Occurrence: As cement in phosphatic soils and bioclastic limestones. An accessory mineral in carbonatites and alkaline igneous rocks.

Association: Calcite.

Distribution: Carbonatian hydroxylapatite has been analyzed from many localities, although the species is not well-characterized, as the mechanism whereby carbonate is incorporated is controversial. At the Ødegården apatite mines, Bamble, Norway. From the Kaiserstuhl, Baden-Württemberg, Germany. Found on Tuvalu (Ellice Islands), central Pacific. At Phalaborwa, Transvaal, South Africa. From Magnet Cove, Hot Spring Co., Arkansas, USA.

Name: For a *carbonate-rich hydroxylapatite*.

Type Material: n.d.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 879–889. (2) Chang, L.L.Y., R.A. Howie, and J. Zussman (1996) Rock-forming minerals, (2nd edition), v. 5B, non-silicates, 297–334. (3) Sommerauer, J. and K. Katz-Lehnert (1985) A new partial substitution mechanism of CO₃²⁻/CO₃OH³⁻ and SiO₄⁴⁻ for the PO₄³⁻ group in hydroxyapatite from the Kaiserstuhl alkaline complex (SW-Germany). *Contr. Mineral. Petrol.*, 91, 360–368.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise without the prior written permission of Mineral Data Publishing.