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THE UNIT CELL OF MALACHITE

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The only unit cell data on record for malachite are those of Brasseur (1932). The authors of this paper, each working independently, found that there is a considerable error in the value of the angle β, as reported by Brasseur.

The axial ratio given in Dana (1909) for malachite is that of Lang (1863–4), who reported the values 0.8809:1:0.4012, with $\beta = 61°\ 50'$. In this orientation the prominent cleavage is {001}. Goldschmidt (1918) chose a setting with the cleavage as {101}, and gave the axial ratio as 0.7823:1:0.4036, with $\beta = 91°\ 03'$.

In his work on the crystal structure of malachite, Brasseur assumed the Goldschmidt value of 91° 03′ for β. The unit cell dimensions reported by him are $a_0 = 9.38kX$, $b_0 = 11.95$, $c_0 = 3.18$, giving an axial ratio of

MALACHITE. Angle Table*

$a:b:c = 0.7914:1:0.2691$; $\beta = 98°44'$; $p_0:q_0:r_0 = 0.3400:0.2660:1$

$r_2:p_2:q_2 = 3.7598:1.2784:1$; $\mu = 81°16'$; $p_0' = 0.3440$; $q_0' = 0.2691$; $x_0' = 0.1536$

Common forms		ϕ	ρ	ϕ_2	ρ_2	C	A
c 001		90°00′	8°44′	81°16′	90°00′	0°00′	81°16′
b 010		0 00	90 00	—	0 00	90 00	90 00
a 100		90 00	90 00	0 00	90 00	81 16	0 00
m 110		51 58	90 00	0 00	51 58	83 08	38 02
p $\bar{2}01$	—	90 00	28 07	118 07	90 00	36 51	118 07

Less common forms: x $\bar{1}02$, γ 011, ϵ 111.

Rare or uncertain forms: 130, 104, 101, $\bar{1}08$, 708, 134, 232, 562, $\bar{1}68$, $\bar{1}98$, $\bar{1}65$, $\bar{8}\cdot 15_{7}16$, $\bar{1}22$.

* Based on angles of Lang, but with the Ramsdell-Wolfe unit and orientation.

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0.7845:1:0.266. This value for c is just two-thirds of that given by Goldschmidt. Brasseur's values for b_0, c_0 and d_{100} are closely checked by the authors, using the Weissenberg method, but they obtain a value of 98° 42′ for the angle β.

The relation between the unit cell thus found and the Goldschmidt unit is shown in Fig. 1. The {101} cleavage of Goldschmidt becomes $\{\bar{2}01\}$ in the unit cell, and the value of c is reduced by one-third. It is not clear how Brasseur indexed his rotation films on the basis of $\beta=91°\ 03'$. The direction he used as [100] is actually $[\bar{2}0\bar{1}]$ in the unit cell. No attempt to determine the structure of malachite has been made by the authors. But in view of the use of an erroneous value of β, the structure proposed by Brasseur must be regarded as questionable. The discrepancy between the morphological lattice and the x-ray lattice of Brasseur is, of course, explained by his improper value of β.

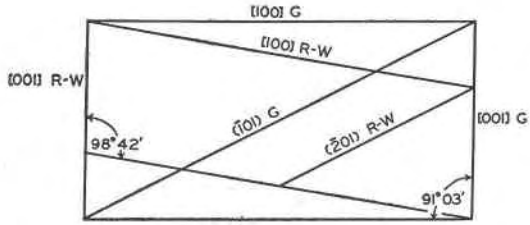

FIG. 1. Diagram showing relationship of the Goldschmidt (G) orientation of the morphological unit and the Ramsdell-Wolfe (R-W) structural unit cell.

Unit cell data

$a_0=9.49$ Å, $b_0=12.00$ Å, $c_0=3.24$ Å; $\beta=98°42'$; $a_0:b_0:c_0=0.790:1:0.270$.

Space group $P2_1/a$.

Morphology

Previous morphological descriptions are transformed to the x-ray unit and orientation as follows:

Goldschmidt to Ramsdell-Wolfe: $\bar{1}0\bar{\frac{1}{3}}/0\bar{1}0/00\frac{2}{3}$. The old elements thus transformed become $a:b:c=0.7914:1:0.2691$; $\beta=98°44'$. Dana to Ramsdell-Wolfe: $\bar{1}0\bar{\frac{4}{3}}/0\bar{1}0/00\frac{2}{3}$.

Twinning

Twin plane {100} is very common, often as penetration twins, sometimes polysynthetic. Twin index 1, obliquity 1°03′. Complementary law twinning about [201] also, as indicated by some x-ray photographs and by two measured crystals.

Physical properties

Cleavage $\{\bar{2}01\}$, which, considering the space group, is a plane of maxi-

mum spacing. Measured gravity on crystals 4.05 ± 0.02. Calculated gravity 4.004.

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ANNOUNCEMENT OF NEW AWARD OF THE MINERALOGICAL SOCIETY OF AMERICA

At the Council meeting of the Mineralogical Society of America held on November 10, 1949 it was voted to establish a new award to be given under the following conditions:

1. The name of the award shall be the Mineralogical Society of America Award.*
2. The award shall be life membership in the *Mineralogical Society of America.* A certificate as evidence of the award, signed by the President and Secretary of the Society, shall be presented to the recipient at the annual meeting.
3. The award shall be given to an individual for an outstanding contribution within the fields of interest of the Society. The contribution must be the published results of original research made during the three years prior to selection by the Council.
4. The work for which the award is given must have been accomplished at an age of thirty-five years or less.
5. The award shall be made without regard to nationality. Membership in the Mineralogical Society of America is not a necessary prerequisite.
6. The President shall appoint a committee to nominate a recipient. The selection, however, shall be subject to the approval of the Council.
7. The award shall be given annually only if a suitable candidate can be selected by the Council.

The committee appointed by President Tunell to select a recipient for this new award is:

N. L. Bowen, Chairman
J. E. Hawley
M. N. Short

The committee will welcome suggestions from Fellows of suitable candidates for the award.

C. S. HURLBUT, JR., *Secretary*

* This name is to be used temporarily until a more suitable name is found.