Anatase (TiO_2, $C5$) Structure: A2B_tI12_141_e_a-001

This structure previously used the label(s) `A2B_tI12_141_e_a`. Calls to these addresses will be redirected here.

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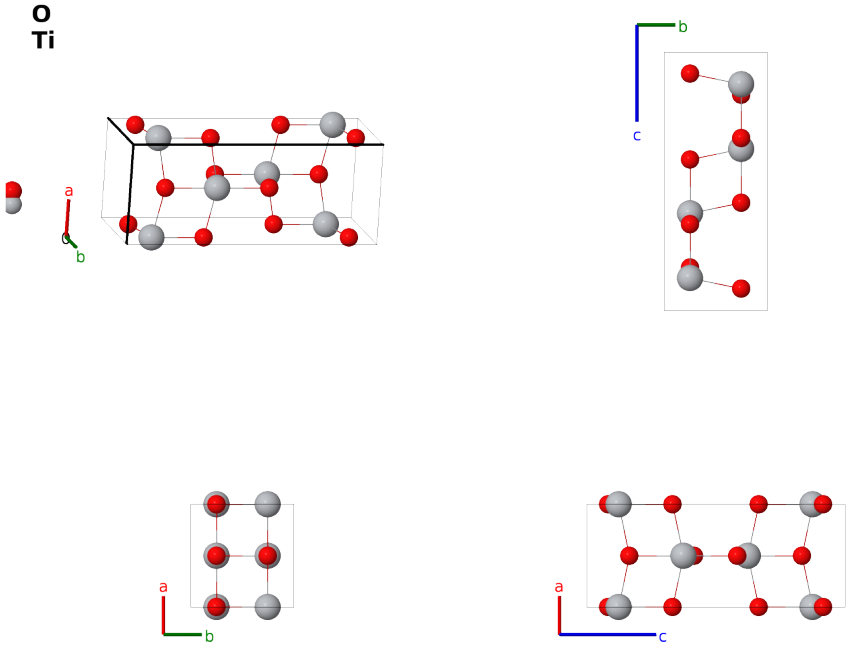
https://aflow.org/prototype-encyclopedia/1TUW

https://aflow.org/prototype-encyclopedia/A2B_tI12_141_e_a-001



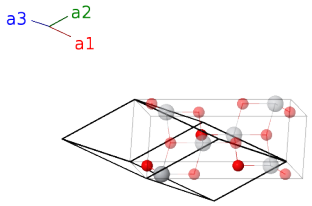
Prototype	O_2Ti
AFLOW prototype label	A2B_tI12_141_e_a-001
***Strukturbericht* designation**	$C5$
Mineral name	anatase
ICSD	63711
CCDC	1626783
Pearson symbol	tI12
Space group number	141
Space group symbol	$I4_1/amd$

AFLOW prototype command `aflow --proto=A2B_tI12_141_e_a-001 --params=`$a, c/a, z_2$

- TiO_2 can also be found as rutile ($C4$) and brookite ($C21$).
- (Howard, 1991) gives the positions of the atoms in terms of setting 1 of space group $I4_1/amd$ #141. When we originally translated this to our standard setting 2 we entered an incorrect position for the oxygen z coordinate, giving incorrect Ti-O bond lengths and angles. This has been corrected in the current version of the CIF and the POSCAR.
- Anatase TiO_2 ($C5$), α-$ThSi_2$ (C_c), and β-Mo_2N share the same AFLOW prototype label, A2B_tI12_141_e_a. The structures are generated by the same symmetry operations with different sets of parameters (`--params`) specified in their corresponding CIF files.

Body-centered Tetragonal primitive vectors

$$\mathbf{a_1} = -\frac{1}{2}a\,\hat{\mathbf{x}} + \frac{1}{2}a\,\hat{\mathbf{y}} + \frac{1}{2}c\,\hat{\mathbf{z}}$$
$$\mathbf{a_2} = \frac{1}{2}a\,\hat{\mathbf{x}} - \frac{1}{2}a\,\hat{\mathbf{y}} + \frac{1}{2}c\,\hat{\mathbf{z}}$$
$$\mathbf{a_3} = \frac{1}{2}a\,\hat{\mathbf{x}} + \frac{1}{2}a\,\hat{\mathbf{y}} - \frac{1}{2}c\,\hat{\mathbf{z}}$$



Basis vectors

		Lattice coordinates		Cartesian coordinates	Wyckoff position	Atom type
$\mathbf{B_1}$	=	$\frac{7}{8}\,\mathbf{a}_1 + \frac{1}{8}\,\mathbf{a}_2 + \frac{3}{4}\,\mathbf{a}_3$	=	$\frac{3}{4}a\,\hat{\mathbf{y}} + \frac{1}{8}c\,\hat{\mathbf{z}}$	(4a)	Ti I
$\mathbf{B_2}$	=	$\frac{1}{8}\,\mathbf{a}_1 + \frac{7}{8}\,\mathbf{a}_2 + \frac{1}{4}\,\mathbf{a}_3$	=	$\frac{1}{2}a\,\hat{\mathbf{x}} - \frac{1}{4}a\,\hat{\mathbf{y}} + \frac{3}{8}c\,\hat{\mathbf{z}}$	(4a)	Ti I
$\mathbf{B_3}$	=	$\left(z_2 + \frac{1}{4}\right)\,\mathbf{a}_1 + z_2\,\mathbf{a}_2 + \frac{1}{4}\,\mathbf{a}_3$	=	$\frac{1}{4}a\,\hat{\mathbf{y}} + cz_2\,\hat{\mathbf{z}}$	(8e)	O I
$\mathbf{B_4}$	=	$z_2\,\mathbf{a}_1 + \left(z_2 + \frac{1}{4}\right)\,\mathbf{a}_2 + \frac{3}{4}\,\mathbf{a}_3$	=	$\frac{1}{2}a\,\hat{\mathbf{x}} + \frac{1}{4}a\,\hat{\mathbf{y}} + c\left(z_2 - \frac{1}{4}\right)\,\hat{\mathbf{z}}$	(8e)	O I
$\mathbf{B_5}$	=	$-\left(z_2 - \frac{3}{4}\right)\,\mathbf{a}_1 - z_2\,\mathbf{a}_2 + \frac{3}{4}\,\mathbf{a}_3$	=	$\frac{3}{4}a\,\hat{\mathbf{y}} - cz_2\,\hat{\mathbf{z}}$	(8e)	O I
$\mathbf{B_6}$	=	$-z_2\,\mathbf{a}_1 - \left(z_2 - \frac{3}{4}\right)\,\mathbf{a}_2 + \frac{1}{4}\,\mathbf{a}_3$	=	$\frac{1}{2}a\,\hat{\mathbf{x}} - \frac{1}{4}a\,\hat{\mathbf{y}} - c\left(z_2 - \frac{1}{4}\right)\,\hat{\mathbf{z}}$	(8e)	O I

References

[1] C. J. Howard, T. M. Sabine, and F. Dickson, *Structural and thermal parameters for rutile and anatase*, Acta Crystallogr. Sect. B **47**, 462–468 (1991), doi:10.1107/S010876819100335X.

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