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1.1. Printed symbols for crystallographic items

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1.1.1. Vectors, coefficients and coordinates

Printed symbol	Explanation
a, **b**, **c**; or $\mathbf{a}_i$	Basis vectors of the direct lattice
a, b, c	Lengths of basis vectors, lengths of cell edges (Lattice or cell parameters)
α, β, γ	Interaxial (lattice) angles $\mathbf{b} \wedge \mathbf{c}$, $\mathbf{c} \wedge \mathbf{a}$, $\mathbf{a} \wedge \mathbf{b}$ (Lattice or cell parameters)
V	Cell volume of the direct lattice
G	Matrix of the geometrical coefficients (metric tensor) of the direct lattice
g_{ij}	Element of metric matrix (tensor) **G**
r; or **x**	Position vector (of a point or an atom)
r	Length of the position vector **r**
$x\mathbf{a}$, $y\mathbf{b}$, $z\mathbf{c}$	Components of the position vector **r**
x, y, z; or x_i	Coordinates of a point (location of an atom) expressed in units of a, b, c; coordinates of end point of position vector **r**; coefficients of position vector **r**
$\boldsymbol{x} = \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$	Column of point coordinates or vector coefficients
t	Translation vector
t	Length of the translation vector **t**
t_1, t_2, t_3; or t_i	Coefficients of translation vector **t**
$\boldsymbol{t} = \begin{pmatrix} t_1 \\ t_2 \\ t_3 \end{pmatrix}$	Column of coefficients of translation vector **t**
u	Vector with integral coefficients
u, v, w; or u_i	Integers, coordinates of a (primitive) lattice point; coefficients of vector **u**
$\boldsymbol{u} = \begin{pmatrix} u \\ v \\ w \end{pmatrix} = \begin{pmatrix} u_1 \\ u_2 \\ u_3 \end{pmatrix}$	Column of integral point coordinates or vector coefficients
o	Zero vector
$\boldsymbol{o}$	Column of zero coefficients
$\mathbf{a}'$, $\mathbf{b}'$, $\mathbf{c}'$; or $\mathbf{a}'_i$	New basis vectors after a transformation of the coordinate system (basis transformation)
$\mathbf{r}'$; or $\mathbf{x}'$; x', y', z'; or x'_i	Position vector and point coordinates after a transformation of the coordinate system (basis transformation)
$\tilde{\mathbf{r}}$; or $\tilde{\mathbf{x}}$; $\tilde{x}$, $\tilde{y}$, $\tilde{z}$; or $\tilde{x}_i$	New position vector and point coordinates after a symmetry operation (motion)

1.1.2. Directions and planes

Printed symbol	Explanation
$[uvw]$	Indices of a lattice direction (zone axis)
$\langle uvw \rangle$	Indices of a set of all symmetrically equivalent lattice directions
(hkl)	Indices of a crystal face, or of a single net plane (Miller indices)
$(hkil)$	Indices of a crystal face, or of a single net plane, for the hexagonal axes $\mathbf{a}_1$, $\mathbf{a}_2$, $\mathbf{a}_3$, **c** (Bravais–Miller indices)
$\{hkl\}$	Indices of a set of all symmetrically equivalent crystal faces ('crystal form'), or net planes
$\{hkil\}$	Indices of a set of all symmetrically equivalent crystal faces ('crystal form'), or net planes, for the hexagonal axes $\mathbf{a}_1$, $\mathbf{a}_2$, $\mathbf{a}_3$, **c**
hkl	Indices of the Bragg reflection (Laue indices) from the set of parallel equidistant net planes (hkl)
d_{hkl}	Interplanar distance, or spacing, of neighbouring net planes (hkl)

1.1.3. Reciprocal space

Printed symbol	Explanation
$\mathbf{a}^*$, $\mathbf{b}^*$, $\mathbf{c}^*$; or $\mathbf{a}^*_i$	Basis vectors of the reciprocal lattice
a^*, b^*, c^*	Lengths of basis vectors of the reciprocal lattice
α^*, β^*, γ^*	Interaxial (lattice) angles of the reciprocal lattice $\mathbf{b}^* \wedge \mathbf{c}^*$, $\mathbf{c}^* \wedge \mathbf{a}^*$, $\mathbf{a}^* \wedge \mathbf{b}^*$
$\mathbf{r}^*$; or **h**	Reciprocal-lattice vector
h, k, l; or h_i	Coordinates of a reciprocal-lattice point, expressed in units of a^*, b^*, c^*, coefficients of the reciprocal-lattice vector $\mathbf{r}^*$
V^*	Cell volume of the reciprocal lattice
$\mathbf{G}^*$	Matrix of the geometrical coefficients (metric tensor) of the reciprocal lattice

1.1.4. Functions

Printed symbol	Explanation
$\rho(xyz)$	Electron density at the point x, y, z
$P(xyz)$	Patterson function at the point x, y, z
$F(hkl)$; or F	Structure factor (of the unit cell), corresponding to the Bragg reflection hkl
$\lvert F(hkl)\rvert$; or $\lvert F\rvert$	Modulus of the structure factor $F(hkl)$
$\alpha(hkl)$; or α	Phase angle of the structure factor $F(hkl)$

1.1.5. Spaces

Printed symbol	Explanation
n	Dimension of a space
X	Point
$\tilde{X}$	Image of a point X after a symmetry operation (motion)
E^n	(Euclidean) point space of dimension n
$\mathbf{V}^n$	Vector space of dimension n
$\mathbf{L}$	Vector lattice
L	Point lattice

1.1.6. Motions and matrices

Printed symbol	Explanation
W; M	Symmetry operation; motion
($\boldsymbol{W}$, $\boldsymbol{w}$)	Symmetry operation W, described by an $(n \times n)$ matrix $\boldsymbol{W}$ and an $(n \times 1)$ column $\boldsymbol{w}$
$\mathbb{W}$	Symmetry operation W, described by an $(n+1) \times (n+1)$ 'augmented' matrix
$\boldsymbol{I}$	$(n \times n)$ unit matrix
T	Translation
($\boldsymbol{I}$, $\boldsymbol{t}$)	Translation T, described by the $(n \times n)$ unit matrix $\boldsymbol{I}$ and an $(n \times 1)$ column $\boldsymbol{t}$
$\mathbb{T}$	Translation T, described by an $(n+1) \times (n+1)$ 'augmented' matrix
I	Identity operation
($\boldsymbol{I}$, $\boldsymbol{o}$)	Identity operation I, described by the $(n \times n)$ unit matrix $\boldsymbol{I}$ and the $(n \times 1)$ column $\boldsymbol{o}$
$\mathbb{I}$	Identity operation I, described by the $(n+1) \times (n+1)$ 'augmented' unit matrix
$\mathbb{r}$, or $\mathbb{x}$	Position vector (of a point or an atom), described by an $(n+1) \times 1$ 'augmented' column
($\boldsymbol{P}$, $\boldsymbol{p}$); or ($\boldsymbol{S}$, $\boldsymbol{s}$)	Transformation of the coordinate system, described by an $(n \times n)$ matrix $\boldsymbol{P}$ or $\boldsymbol{S}$ and an $(n \times 1)$ column $\boldsymbol{p}$ or $\boldsymbol{s}$
$\mathbb{P}$; or $\mathbb{S}$	Transformation of the coordinate system, described by an $(n+1) \times (n+1)$ 'augmented' matrix
($\boldsymbol{Q}$, $\boldsymbol{q}$)	Inverse transformation of ($\boldsymbol{P}$, $\boldsymbol{p}$)
$\mathbb{Q}$	Inverse transformation of $\mathbb{P}$

1.1.7. Groups

Printed symbol	Explanation
$\mathcal{G}$	Space group
$\mathcal{T}$	Group of all translations of $\mathcal{G}$
$\mathcal{S}$	Supergroup; also used for site-symmetry group
$\mathcal{H}$	Subgroup
$\mathcal{E}$	Group of all motions (Euclidean group)
$\mathcal{A}$	Group of all affine mappings (affine group)
$\mathcal{N}_{\mathcal{E}}(\mathcal{G})$; or $\mathcal{N}_{\mathcal{A}}(\mathcal{G})$	Euclidean or affine normalizer of a space group $\mathcal{G}$
$\mathcal{P}$	Point group
$\mathcal{C}$	*Eigensymmetry* (inherent symmetry) group
$[i]$	Index i of sub- or supergroup
G	Element of a space group $\mathcal{G}$

references