A space group is called 'symmorphic' if, apart from the lattice translations, all generating symmetry operations leave one common point fixed. Permitted as generators are thus only the point-group operations: rotations, reflections, inversions and rotoinversions. The symmorphic space groups may be easily identified because their Hermann-Mauguin symbol does not contain a glide or screw operation. The combination of the Bravais lattices with symmetry elements with no translational components yields the 73 symmorphic space groups, e.g. P2, Cm, P2/m, P222, P32, P23. They are in one to one correspondence with the arithmetic crystal classes.

A characteristic feature of a symmorphic space group is the existence of a special position, the site-symmetry group of which is isomorphic to the point group to which the space group belongs. Symmorphic space groups have no zonal or serial reflection conditions, but may have integral reflection conditions (e.g. C2, Fmmm).

Note

In the literature sometimes it is found the wrong statement that a symmorphic space group does not contain glide planes or screw axes. This comes from a misunderstanding for the fact that, according to the priority rule, glide planes and screw axes do not appear in the Hermann-Mauguin symbol of the space group, although they can be present in the group. For example, a space group of type Amm2 contains c glides perpendicular to [010] et passing at x,1/4,z and two-fold screws parallel to [001] and passing at 0,1/4,z. This is not even limited to space groups with centered conventional cells: for example, a space group of type P422 contains two-fold screws parallel to the two-fold axes.

See also

Sections 2.2.5 and 8.1.6 of *International Tables for Crystallography, Volume A*
Section 1.4 of *International Tables for Crystallography, Volume C*

Contributors

- Online Dictionary of Crystallography