Global Research Journal of Natural Science and Technology Vol 1 Issue 2

Unit Cell: Features, Network Permanence and Types

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Abstract

Unit cell is an imaginary place or region that represents the minimum expression as a whole. That in the case of chemistry, the whole atom would be a crystal consisting of ions or molecules, arranged after a structural pattern. Examples embodying this theory can be found in everyday life. For this it is necessary to pay attention to the objects or surfaces which show a certain repetitive arrangement of their elements. Some mosaics, base reliefs, coffered ceilings, sheets and wallpaper, may be included in the general terms considered by the unit cell. To make it clearer, we have the image above which can be used as wallpaper. In it, cats and goats appear with two alternate senses. Cats are upright or upside down, and goats are facing up or down. This is a repetitive structuring of cats and goats. It will suffice to reproduce the unit cell across the entire surface, using the translation, the translator's movement, to construct the whole paper.

Key Words: Unit Cell, Features, Network, Permanence, Types

Introduction:

Potential unit cells are represented by blue, green, and red cells. Any of these three can be used to play a role. But, in order to know if it is necessary to move imaginatively along their surface to find out if they reproduce the same sequence as observed in the image.

Starting with the red box, it would be appreciated that if the three columns (of cats and goats) were moved to the left, two goats would no longer appear at the bottom but only one. So it will lead to another continuity and it cannot be considered as a unit cell. However, if they move two boxes of imaginary and blue and green, the same order of paper will be found. Both units are cell; However, the blue box is more compliant, as it is smaller than the green box.

Unit Cell Properties

Its own definition, which, apart from just the given example, illustrates several features of it:

-If they move in space, regardless of the direction, solid or complete crystals will be obtained. This is because, as mentioned with cats and goats, they reproduce the structural order. Which is equal to the local distribution of repeating units.

They must be as small (or as small as possible) compared to other possible cell options.

They are usually symmetrical. Also, its balance is literally reflected in the crystals of the compound. If the unit of salt is a cell cube, then its crystals will be cubic. However, there are crystal line structures that have been described as unit cells with distorted geometries.

They consist of recurring units, which can be replaced by points, and as a result become things known as lattice in three dimensions. The above example of cats and goats represents fake points, seen from a high plane. That is, two dimensions.

Number of repeating units

Fake points of repeating units or unit cells retain the same proportion of solid particles.

If you count the number of cats and goats in the blue box, you will have the number of two cats and goats. The same thing happens with the green box and the red box (even if it is already known that the unit is not a cell).

Suppose, for example, that a goat and a goat are G and C atoms, respectively (the weld of a strange animal). Since the ratio of C to G in the blue box is 2: 2 or 1: 1, it is safe to assume that the solid formula will be GC (or CG).

When solids have minimally compact structures, such as salts, metals, oxides, sulfides, and alloys, the unit cells do not have a complete repeating unit. That is, they have parts or segments, which add up to one or two units.

This is not the case with GC. If so, the blue box will divide cats and goats into two (1 / 2G and 1 / 2C) or four (1 / 4G and 1 / 4C). In future sections it will be seen that the mesh points in these unit cells are easily divided in this and other ways.

Which network permanently defines a unit cell?

In the GC example, unit cells are two-dimensional. However, this does not apply to real models that consider all three dimensions. Thus, squares or parallelograms are converted into parallel pads. Now, the term "cell" is more meaningful.

The dimensions of these cells or parallel leaves depend on how long their respective sides and angles are.

In the image below, there are parallel pipe corners to your bottom that consist of sides, b y c, and angles 1 2 and 3.

As you can see, is a little longer than b y c. The circle in the center has a dotted line in the center to indicate the angles between β and γ, ac, cb y b a. Qul has values, and explains its harmony and the rest of the crystal.

To reuse some imagination, to image parameters will define the cube-like cell protruding on its edge. In this way, the cells of the unit are produced with different lengths and angles of their edges, which can also be classified into different types.

Types

Note that starting with the binding lines in the unit cells in the image above: they indicate the angle of the bottom, as just described. The following question may be asked, where are the fake points or repeat units? Although they give the false impression that the cells are empty, the answer is in their vertical part.

These cells are arranged or selected in such a way that the repetitive units (the gray dots of the image) are located on their vertical part. Depending on the values of the parameters set in the previous section, seven permanent, seven crystal systems are derived for each unit cell.

Each crystal system has its own unit cell. The second explains the former. There are seven boxes in the upper image, corresponding to the seven crystal systems. Or more succinctly, Crystal Networks. Thus, for example, a cubic unit corresponds to one of the cell crystal systems that defines a cubic crystal lattice.

According to the picture, the crystal system or network is:

- Cube
- Tetragonal
- Arthorhombic
- Hexagonal
- Monoclinic
- Triclinic
- Turkonel

And within these crystal line systems, other people are born who make up the fourteen Browse Networks. Of all the crystal networks, they are the most basic.

Cube

In a cube, all its sides and angles are equal. Therefore, the following is true in this unit cell:

To do = b = c

$\alpha = \beta = \gamma = 90^{\circ}$

There are three cubic unit cells: plain or primitive, body center (BCC), and face center (FCC). Differences are found in how points are divided (atoms, ions or molecules) and in their number.

Which of these cells is the most compact? The one whose volume occupies the maximum points: the center on the cubic faces. Note that if we change the points for cats and goats from the beginning, they will not be limited to a single cell. They will be connected through many people. Again, these would be parts of G or C.

Number of units

If cats or goats were on top, they would be divided into 8 unit cells. That is, each cell contains one / 8th part of G8 or C, or to look at it, you have to put or imagine 8 cubes together in two columns of two rows in each row.

If they were on the faces of cats or goats, they would be shared by only 2 units of cells. To see it, just put two cubes together.

On the other hand, if a cat or a goat were in the middle of a cube, they would belong to only one unit cell. The same thing applies with ezines.

That said, inside a simple cube unit cell we have is a unit or mesh point, since it has 8 widths ($1/8 \times 8 = 1$). For the center cubic cell in the body are: 8 vertical, which is equal to one atom, and one point or unit in the center; So there are two units

And for a face-based cubic cell, these are: 8 vertical (1) and six faces, where half of each point or unit ($1/2 \times 6 = 3$) is common. So it has four units

Tetragonal

Similar comments can be made about the unit cell of the tetragonal system. Its structural parameters are as follows:

To do = b ≠ c

$\alpha = \beta = \gamma = 90^o$

Orthohombic

The parameters of the orthobomic cell are:

To ≠ b ≠ c

$\alpha = \beta = \gamma = 90^o$

Monoclinic

Monoclinic cell parameters are:

To ≠ b ≠ c

$\alpha = = 90^o; \neq 90^o$

Triclinic

The parameters of the triclinic cell are:

To ≠ b ≠ c

$\neq \neq \beta \neq \neq \neq 90^o$

Hexagon

The parameters of the hexagonal cell are:

To do = b ≠ c

$\alpha = = 90^o; \neq 120^o$

The cell is actually one-third of the hexagonal paradigm.

Triangle

And finally, the stimulus cell parameters are:

To do = b = c

$\alpha = \beta = \gamma \neq 90^{o}$

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