A *periodic crystal* is a structure with, ideally, sharp diffraction peaks on the positions of a *reciprocal lattice*. The structure then is invariant under the translations of the *direct lattice*. Periodicity here means *lattice periodicity*. Any structure without this property is *aperiodic*. For example, an amorphous system is aperiodic. An *aperiodic crystal* is a structure with sharp diffraction peaks, but without lattice periodicity. Therefore, amorphous systems are not aperiodic crystals. The positions of the sharp diffraction peaks of an aperiodic crystal belong to a *vector module* of finite rank. This means that the diffraction wave vectors are of the form

\[ \mathbf{k} = \sum_{i=1}^{n} h_i \mathbf{a}_i^* \]  

(integer \( h_i \))

The basis vectors \( \{ \mathbf{a}_i^* \} \) are supposed to be independent over the rational numbers, i.e. when a linear combination of them with rational coefficients is zero, all coefficients are zero. The minimum number of basis vectors is the *rank* of the vector module. If the rank \( n \) is larger than the space dimension, the structure is not periodic, but aperiodic.

### Applications

There are four classes of aperiodic structures, but these classes have an overlap:

- *incommensurately modulated crystal phases* (See incommensurate modulated crystal phases),
- *incommensurate composite structures* (See incommensurate composites),
- *quasicrystals* (see quasicrystals),
- and *incommensurate magnetic structures* (See incommensurate magnetic structures).

### Contributors

- Online Dictionary of Crystallography