Abstract

## Tilings, crystals, quasicrystals

A tiling is a collection of plane figures (tiles) that fills the plane with no overlaps and no gaps. It is usually understood that the set of tiles is finite, i.e. for a given finite set of tiles the tiling is achieved using congruent copies of the tiles. The basic example is the tiling with square tiles arranged in a checkerboard pattern. The definition of tiling can be extended to tilings of space with 3-dimensional geometric shapes.

Periodic tilings have the property that a certain pattern is repeated allover the tiling, in a regular fashion. To be more precise, a tiling is periodic if there is a plane lattice such that every cell of the lattice contains a congruent copy of the pattern.

Quasiperiodic tilings are only locally periodic with respect to certain transformations: the basic pattern is repeated somewhere in the plane by translation or rotation, but there is no unique transformation which generates the whole tiling in a periodic way. The best-known quasiperiodic tiling is the Penrose tiling with two rhombuses.

For a long time periodic tilings have been used to model crystals, and as in the 1980es quasicrystals were discovered (quasicrystals have only a quasiperiodic structure), quasiperiodic tilings are a natural choice for modeling quasicrystals.