

A LAYER OF METAL ATOMS

Metals are composed of atoms in ordered layers. These atoms form a three-dimensional, crystalline structure. That means that the individual units within the solid -- the atoms, in this case -- are organized in a regularly repeating pattern, like the stars on the American flag.

Three-dimensional things can be difficult to think about. It's much easier to start in two dimensions. On this page, we're going to look at a couple of ways that metal atoms could arrange themselves in a single layer. We'll build up from there later on. In the meantime, we'll try to develop familiarity with a number of terms that are used to describe crystalline structures.

Simple Squares

We live in a Cartesian society. Our houses and buildings are mostly square, our rooms are square, our streets are straight and meet at right angles, unless we live in a meandering place on the water, like Boston or Venice. It's probably easiest to imagine layers of atoms that form nice squares.

Suppose a group of atoms forms a nice, straight line. Another group forms a second line, and each atom in the second line sits directly behind an atom in the first line. A third row forms in the same way. The resulting layer has neat rows and columns of atoms. The pattern of atoms regularly repeats as you look from right to left, and as you look from front to back.

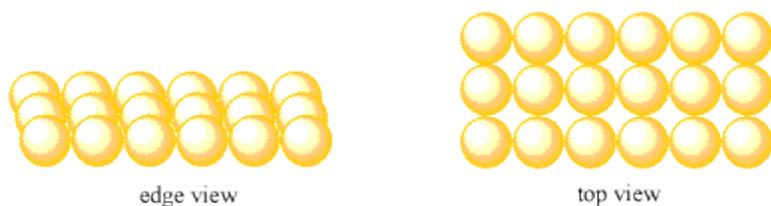


Figure ME2.1. A simple square layer of atoms.

We will call this type of layer a simple square layer.

- In a square layer, atoms are arranged in rows and columns.

Hexagonal Layers

Some metals atoms may be arranged in simple square layers. Others adopt a slightly different arrangement.

Start with the same, neat line of atoms in the first row. This time, when the second row of atoms forms, we won't put them directly behind the atoms in the first row. We'll put them just in between the atoms in front. Each atom in the second row sits behind two atoms in the first row, as if it were peeking between them, like kids in a kindergarten class photo (before they all squirm around).

The third row will also be slightly offset from the row in front of it. If you look carefully, you can see that puts each of the third row atoms directly behind an atom in the first row, but an extra row farther away. The fourth row will be slightly offset from the third, and so on.

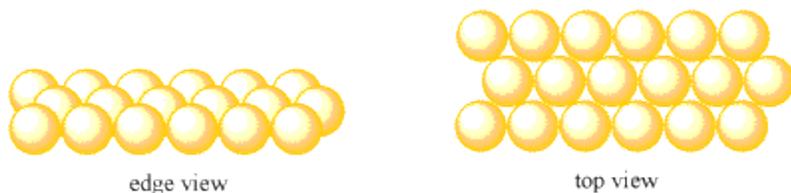


Figure ME2.2. A hexagonal layer of atoms.

We still have a crystalline structure. There is a regularly repeating pattern as we look from left to right. There is also a repeating pattern as we move from front to back, but now that pattern repeats every other row, instead of every row.

This type of layer is called a hexagonal layer. Sometimes, it is called a close-packed layer.

- In a hexagonal layer, the rows are offset from each other by half an atom.
- Each atom in a hexagonal layer is surrounded by six other atoms.

Source : <http://employees.csbsju.edu/cschaller/Principles%20Chem/metals/metallayer.htm>