Bipolar materials

Semiconductors: diodes and transistors

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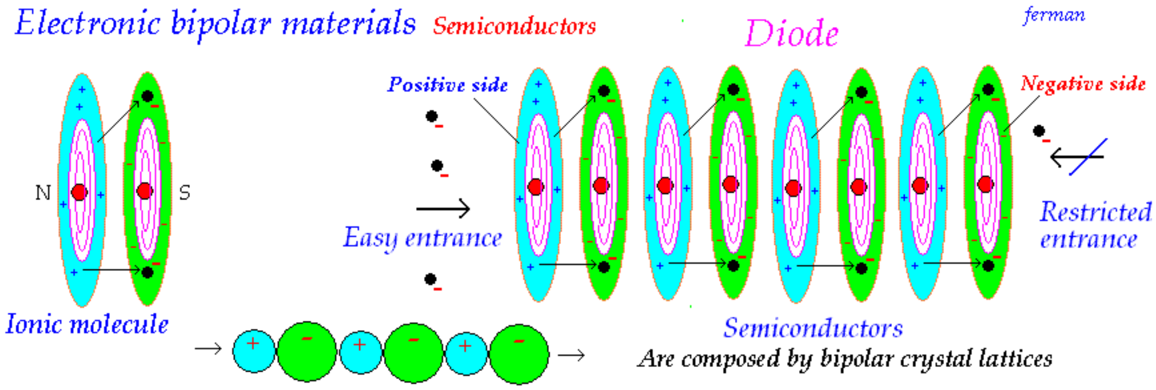
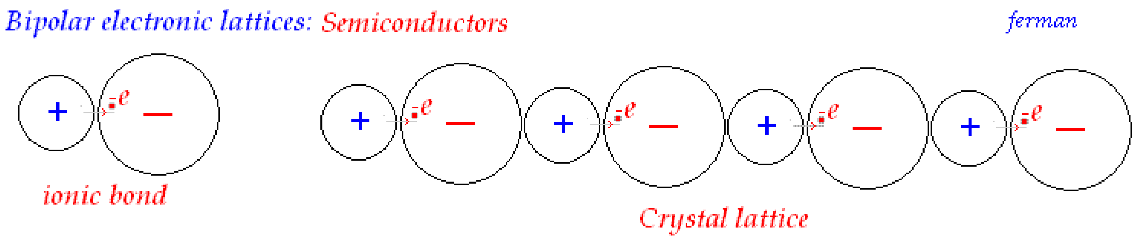
Ionic molecular lattices



Ionic bonds

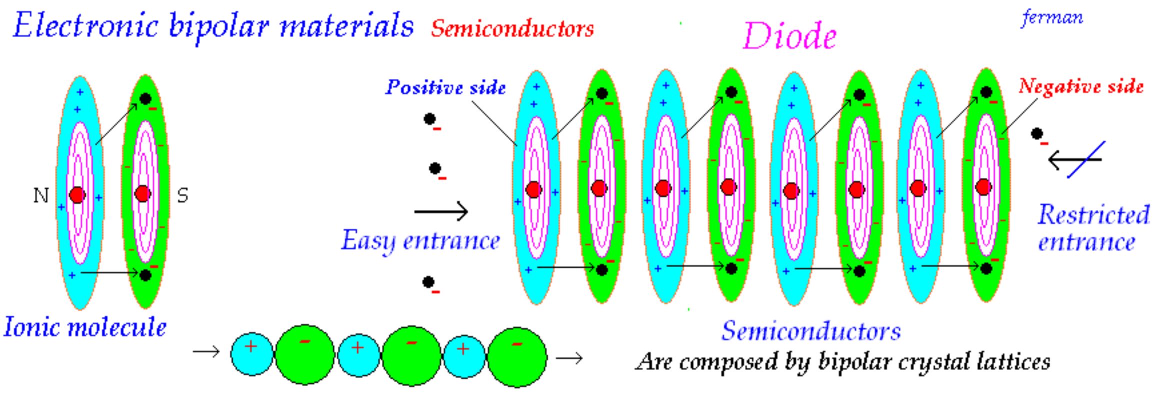
One of the main types of atomic bonds is the ionic form in which one (or several electropositive atoms) cede electrons to other ones (electronegative) to form molecules in which their atoms are maintained united due to the electronic polarity (+/-) that any of them acquires with this union.
Say, atoms that cede electrons remain positively charged; and the ones that capture electrons remain negatively charged what attract and maintain united among them.
This implies the creation of bipolar molecules, with a positive side (side occupied by atoms charged positively) and with a negative side (the one occupied by atoms with negative charge).



Thus these bipolar molecules have logically a lot of properties, inherent to that bipolarity.
This way they can unite themselves by mean of that polarity (union of the positive side of one with the negative side of its neighbor +/-) to form crystalline networks very compact. (+-+-+-+-+-+-+-)

No well, a question arises here:
What occurs if we want to make pass an electric current through these materials formed by crystalline bipolar lattices?
Because of if we try to pass the current by the positive side of the crystalline lattice with some electric potential, the current can introduce inside the material and to pass through it.
But if we try that by the negative side, the current can't pass due to it will be rejected by the negative charges of this side.

Say, these types of bipolar materials have certain capacity by passing the electric current, but in alone one direction.
And precisely this property of bipolarity is used a lot for the fabrication of diodes and transistors.



Diodes and transistors

As we have seen this simple property of bipolarity makes these materials can work as natural diodes, say, that can drive the electric current in only one direction.
Proof of this is the galena (Pb-S) that is formed by atoms of led and sulfur.
On this the led atoms cede electrons to the sulfur atoms, lasting this way the led atoms charged positively and with capacity of admitting electron from a possible exterior electric current.

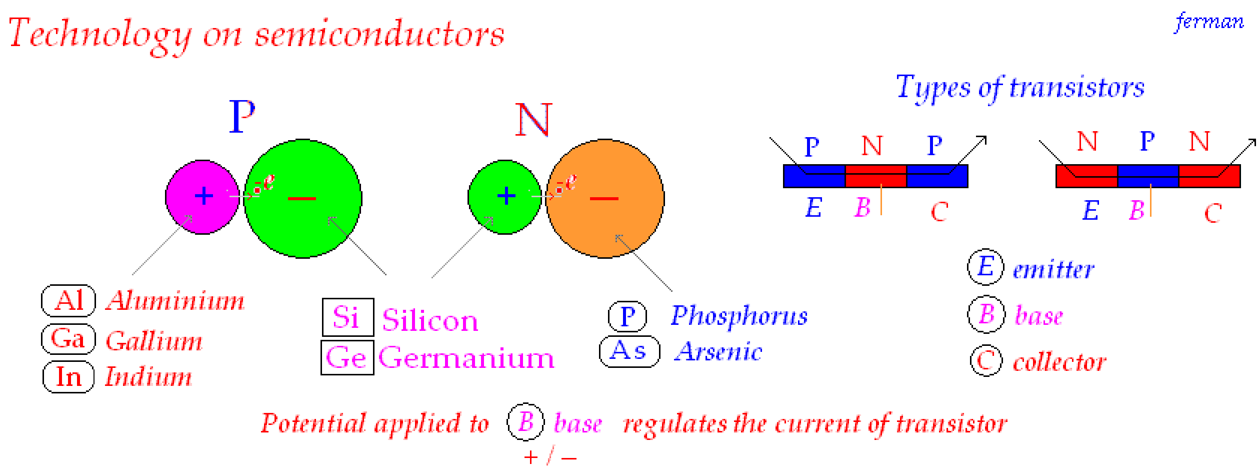
With this functional principle of the diode we can construct multiple types of devices likes different classes of transistors.
As would be logical, the diversity of bipolar materials is wider because of the existence of many chemical elements that can form this type of bonds.
Nevertheless, it will be better those types of atoms of the central table of the elements, which on one hand can cede electron easily, and besides they have wide valence layers for where the free electrons can move.
Say, it has many materials adequate for these uses, but always and for each device and circumstance we must to pick the best one.

Technology in semiconductors: transistors

Several are the chemical elements or materials (and their ways of use) in the construction of semiconductors, but as informative way we expose the most general from an electronic point of view.

In general the semiconductors are built with a basic material of silicon or germanium, but completing with other elements (not adequately called "impurities" or doping) very near in the periodic table of the elements, which are used for ceding (or admitting) electrons in the construction of the ionic bonds.
Later on, each ionic molecule is united to other ones forming the crystal lattice of the semiconductor.
Normally these crystal lattices of semiconductors take the tetrahedron shape, (ending drawing).

The impurities are generally of two types
Electro-positive ones, (Aluminum, gallium, indium) which cede electrons
Electro-negative ones, (Phosphorus, arsenic) which capture electrons



-- The first ones (P) are the donor of electrons to conform the ionic bond, and they should be chemical elements more electropositive than the silicon (or germanium) and so, situated in the anterior group in the table of the elements. They are aluminum, gallium and indium, etc.

This way when uniting silicon with aluminum, the silicon to be more electronegative captures and takes electrons from the aluminum, converting into negative atoms with capacity of cession of electrons to the electric current.

-- The second ones (N), the receptors of electrons in the ionic union, must to be chemical elements more electronegative than silicon (or germanium) and this way these have capacity of capturing and taking electron from the silicon, lasting loaded of electrons, and with capacity of cede these electrons to the electric current.
These receptor elements are situated to the right side of the table of elements, being more electronegative than silicon and with more power to capture electrons, (Phosphorus, arsenic, etc.)
This way when uniting silicon with phosphorus, the phosphorus to be more electronegative, it will capture electrons from silicon, getting charged negatively (store of electrons) with capacity of cession of electrons to the electric current.

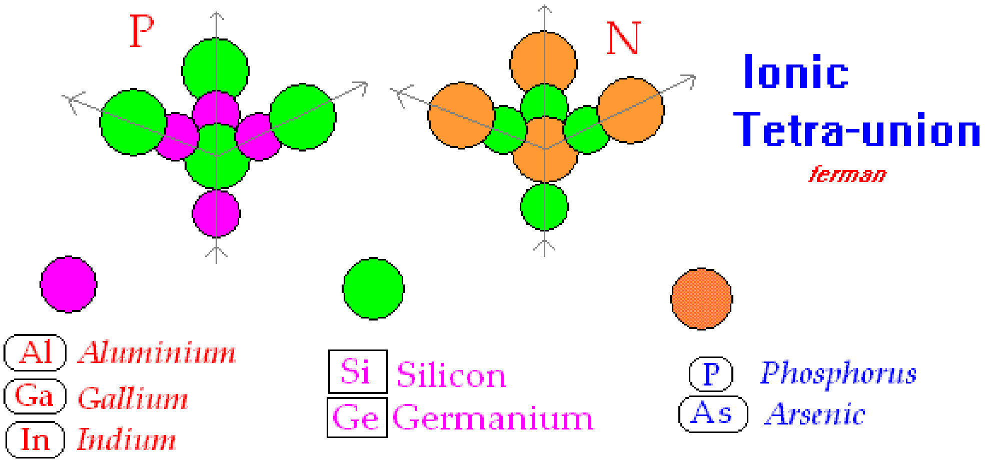
In the building of transistors, we use these two types of material (N and P) but with different quantity of impurities as for the quality of the transistor to contract.
Also with different class of union, polarization of each of the element P or N, dimension of the unions etc., as for the class and special characteristics of the transistor that we need build.

Generally in the construction of transistors it is used two types of union with three elements each one, which are PNP and NPN, where the central module (central letter) is the Base, being the other two Emitter and Collector.

E, Emitter is the side where the electric current entrances
C, Collector if the side for where the electric current exits.
B, Base is the regulator of currant by mean of a variable polarization applied to this base.
This way, the Base B regulates the pass of the electric current along the transistor when we applied different potential or electric polarization on it (+/-).

Electronic foundations of transistors

The functional theory in transistors could be considered simple.
The semiconductor materials that compose transistors, and as its noun means, aren't great conductors of electricity, but they have some resistance to the current.
This questions that at first could seem to be a disadvantage, really it is not, when this resistance admits the possibility of applying areas of polarization (+/-), which can facilitate or clog the pass or current through the transistor.
In this case, if the B module or Base of a transistor is polarized negatively (-) then this negative potential impede or decrease the pass of current (electrons -) along the transistor.
Say, we can make increase or decrease a lot the electric current through the transistor when polarizing the Base B, in such a way that with a minimum polarization in base we can get an important increment of current.



Normally the crystal semiconductors don't follow the lineal shape, but the tetrahedron form; although the functionality is similar.

Negative charges and holes

* I expose here this explanation because of it is demonstrative of the validity of my atomic model.

Another way of explaining the current through transistor is the use of the term "HOLE" instead of positive charge.
In the ionic bonds if an atom cedes an electron, in its abandoned place (orbit) remains a "hole" where before was an electron.
But this hole represents now a positive charge that tends to attract to any nearby electrons.
So clearly this hole is a positive charge situated in the atomic orbit that before occupied the electron.
This atomic mechanical demonstrates that the positive charges reside in the atomic orbits, but no in the central nuclei.
And precisely is what my atomic theory says:

"The positive charges reside in the orbits of atoms, being these orbits the steady and stable positions that are created by and inside the magnetic fields of the orbital magnetic periphery that surrounding nuclei of atoms.