a more or less continuous fashion across the periodic table. Therefore, these boundaries may be not be so well-defined in all places. For example, crystalline carbon (C), known as diamond, which we identified as a non-metal, may also be thought of as a special semiconductor.

With help of the periodic table, we are now in a position to identify the major classes of materials:

1.1   Metals

Let us note first that the metals can be divided into two sub-groups: On the left of the periodic table are the so-called **simple metals** (Groups IA and IIA plus B (boron) and Al (aluminum)), and in the lower middle the so-called **transition metals**. Again the differences in their properties can be related to their electron configurations. By and large, transition metals are the most important engineering metals, and it is with those in mind that we will list important properties of metals below. The simple metals are often used as additives or components in multi-element materials, although of course Al is an important metal in its own right.

You should also be aware that metallic materials need not be elements, but may be formed by combination of two or more elemental metals, in which case one would refer to the material as an **alloy**. Below are listed a few of the major properties of metals used frequently in engineering:

Elemental metals:

- medium mechanical strength,

- high mechanical ductility,

- high electrical conductivity,

- regular arrangement of atoms, crystalline material

Metallic alloys:

- high mechanical strength,

- lower mechanical ductility,

- lower electrical conductivity,

- regular arrangement of atoms, crystalline material

Without going into details, I will just mention here that **strength** designates the ability to withstand a mechanical load, and **ductility** the ability to be deformed without breaking. In addition, high, low, higher, and lower refer to a comparison of an elemental metal and an alloy with the same base metal, for example pure copper (Cu) and brass (Cu with some zinc (Zn) in it).