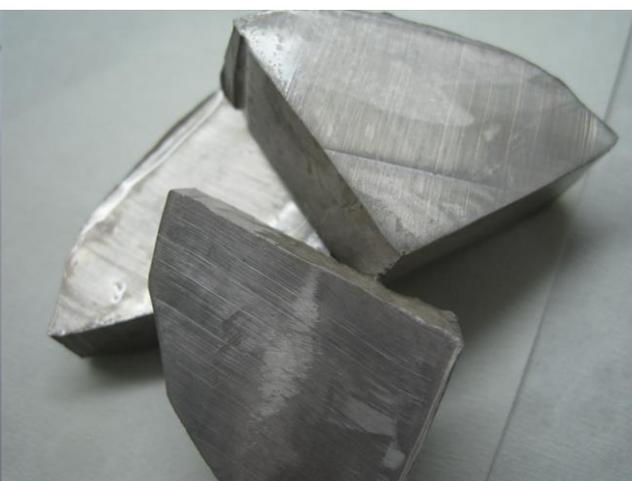


The electronic structure of three Alkali Metals

Notice that in each of these the outermost shell only has 1 electron. This is the valance electron which is easily removed during chemical reactions.



Cs (Caesium)



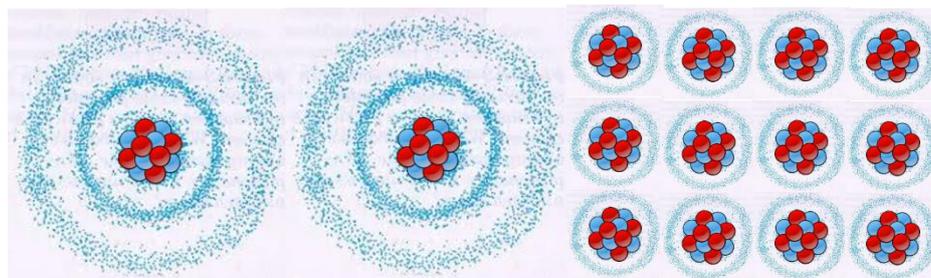
Na (Sodium)

The alkali metals appearance

The alkali metals are always silvery and are usually quite shiny. They are soft and have low melting and boiling points. On a hot day Na (MP 97.72°C) is a solid but Cs (MP 28.4°C) would be a liquid.

An alkali metal

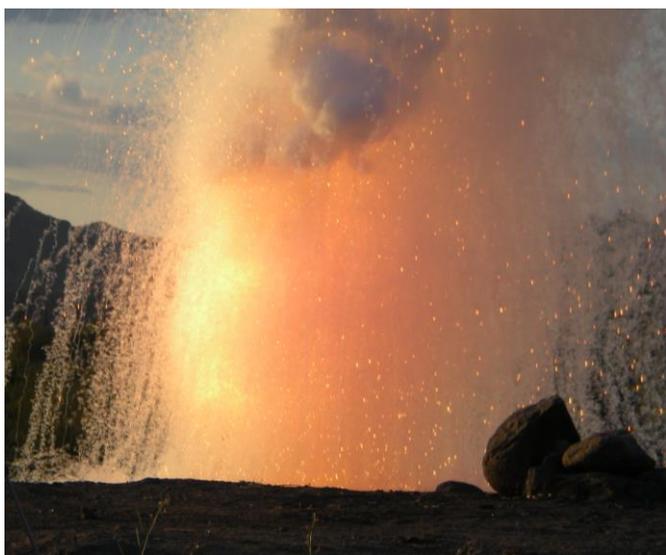
Other element



Alkali metals have large atomic radii

Alkali metals have large atomic radii. This is due to a large spread-out electron cloud. As a result the nuclei can't pack together. Remember, the nuclei are the heavy bit of an atom. As a result Alkali metals are very light and often float on water. The large electron cloud also means that the outer most electrons are far away from the nucleus and can be easily removed when forming compounds.

The alkali metals are very reactive



The Alkali metals easily lose one electron. They form +1 ions in ionic compounds.

The alkali metals even react violently with water to make H_2 gas and $[OH]^-$ ions. The $[OH]^-$ are a base and this is where the alkali metals get their name from, as alkali means a basic solution. In this reaction so much energy is produced that one of the products H_2 gas is ignited and explodes as well.



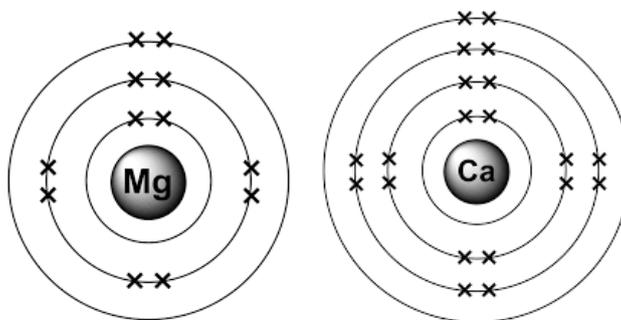
Alkaline earth metals are shiny, and they are silvery white.

The group 2 elements are all silvery white metals. They are fairly soft and can be worked with machines into sheets easily. They have much higher melting points than the group 1 elements and are all solids under normal conditions.



The Alkaline Earth metals are reactive

Though not as reactive as group 1 elements, the Group 2 metals are reactive. They react with water to make H_2 gas and $[OH]^-$ ions. They lose two electrons to make ionic compounds with a +2 ion. The ionic compounds they make with oxygen are very reactive with water. They produce lots of heat and $[OH]^-$ ions which is why they are called alkaline.



Electronic structure of Alkaline earth metals

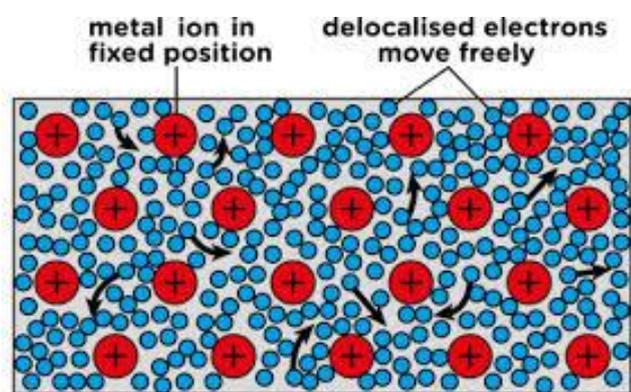
Notice that in each of these the outermost shell (circle around the nucleus) has 2 electrons. These are the valence electrons which is quite easily removed during chemical reactions



The Transition metals make coloured compounds and are sometimes coloured metals

The transition metals have lots of inner electrons. These electrons can absorb light. As a result transition metal compounds like the blue copper sulphate above and some of the metals like gold are coloured.

Transition metals have useful physical properties



Transition metals have lots of interesting physical properties. They have high melting points, are quite strong but are also malleable. This is why they are used in manufacturing so much. In addition they are also very good conductors of electricity and heat. All of these qualities are due to them having lots electrons. The electrons come off the individual atoms and move about metallic cations. The

electrons are moving charged particles and so they conduct electricity and heat well but also make the metals strong by bonding the whole substance together.



Iron Oxide $[\text{Fe}]^{2+}$

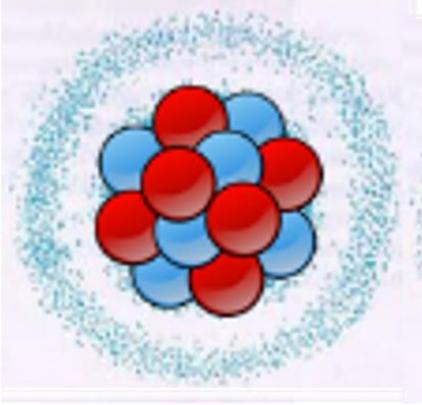


Iron Chloride $[\text{Fe}]^{3+}$

Transition metals can have several charges when making ionic compounds

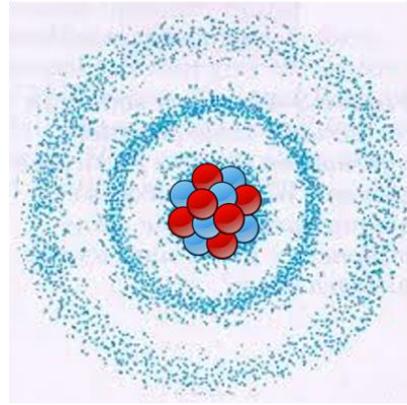
Transition metals are unique as they can lose different amounts of electrons when they make ions. This results in ions of the same element with different charges. For example in Iron can be an Fe^{2+} or Fe^{3+} ion.

Non-metal



Nucleus is large compared to the electron cloud. Strong force to pull electrons in

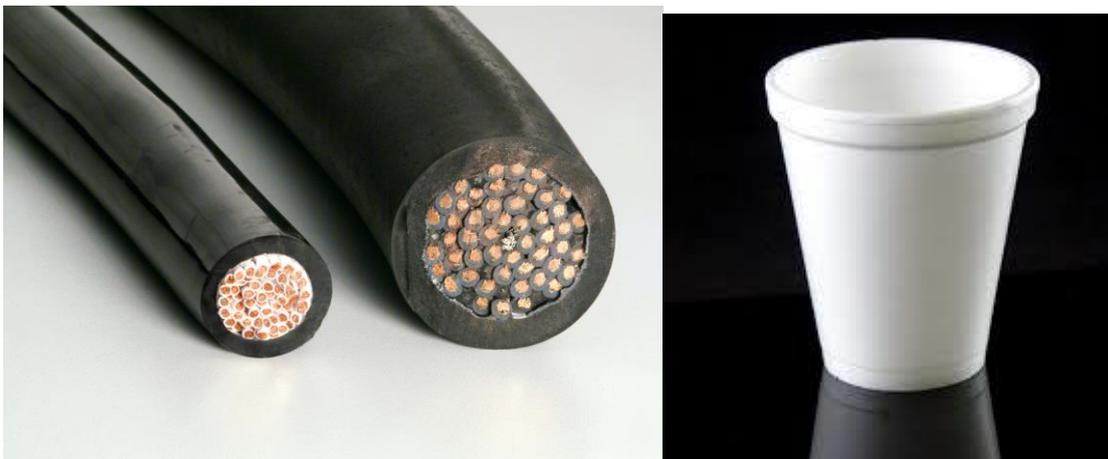
Metal



Nucleus is small compared to the electron cloud. weak force and electrons can leave atom

Non-metals are electron hungry because they have a big nucleus.

As you move across rows in the periodic table the nucleus of atoms get bigger. As a result the Nucleus's positive charge pulls more at electrons of other atoms. This is why Non-metals form negative anions.



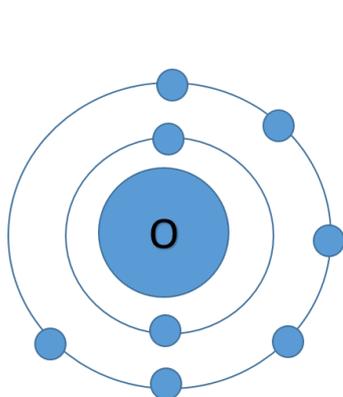
Non-metals are good insulators

Most non-metals do not conduct electricity and are only poor conductors of heat. This is because non-metals unlike metals don't have any loose electrons and they are tightly bound to the atoms. Consequently, there are no freely moving electrons to distribute heat energy or conduct electricity.

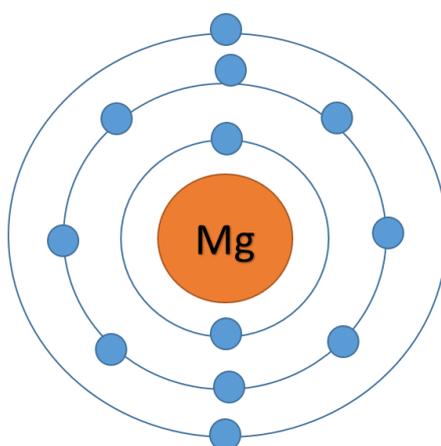


Non-metals are usually gases, and rarely solids or liquids

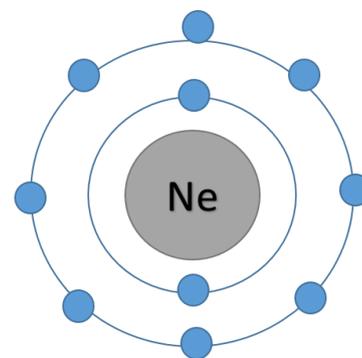
The bonds in a molecule like water are very strong. However, the attraction between molecules is low. As a result they rarely make solids or liquids. The picture above is a hydrogen cloud in space. Space is really cold but hydrogen is still a gas because the forces between molecules in non-metals are not strong



Unstable and wants
2 electrons



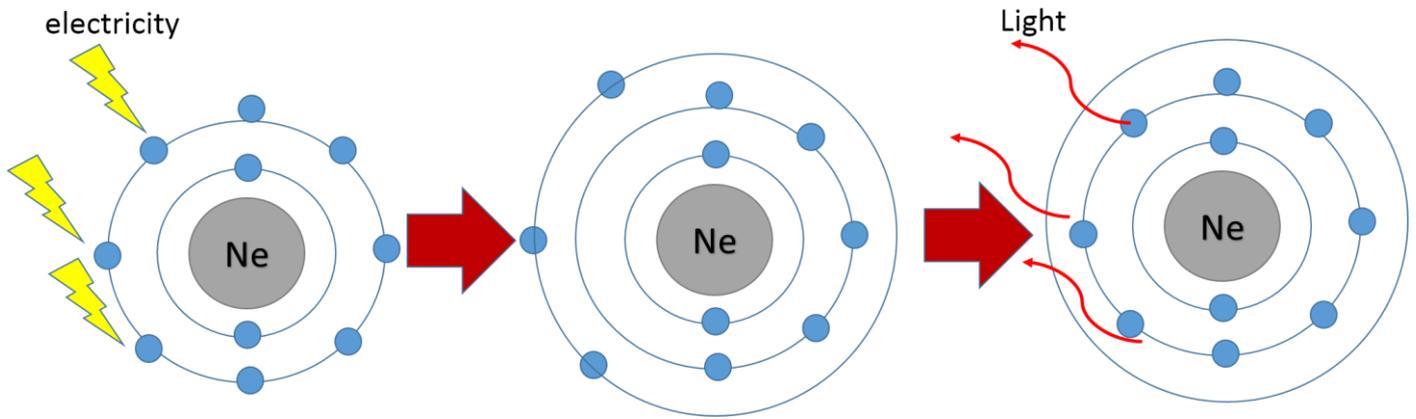
Unstable and wants to
get rid of 2 electrons



Stable

The Noble Gases are unreactive

The Noble gases have a filled outer electron shells. This is 2 for helium and 8 for the others. As a result they are very stable by themselves. They don't want extra electrons. So under normal conditions the noble gases don't form compounds or molecules. For this reason they are often found as single atoms.



The Noble Gases Fluoresce when exposed to electricity

When a Noble Gas is exposed to electricity. The electrons absorb the energy of the electricity. This makes the electrons move away from the nucleus. Later on they release this energy as coloured light and drop back to their original energy shell.

