

The Atom, development of the current model.

The idea of the atom as the smallest possible unit of matter was first thought of by the ancient Greeks. This is also where the word atom comes from as the ancient Greek word “atomos” means indivisible. This idea originated with the philosopher Demokritos who, without any evidence as the ancient Greeks had no way of observing anything as small as the atom, believed that if you divided matter enough times you would reach an indivisible unit.

Nothing really happened in the development of the idea until the English chemist John Dalton, 1766-1844, worked out that an element consist of only one type of atom and when there is a reaction to create a compound which will consist of more than one type of atom. He also found by experimentation the atomic weights of some elements and molecules and stated that all mater is made of atoms, which are the smallest unit of matter and cannot be divided any further. Dalton's model of an atom was a solid small object.

Many scientist did not believe Dalton and the idea of atoms did not develop any more until the early 19th century when the electron was discovered by J.J. Thomson by applying a voltage to gasses and discovered a beam of very small particles. By experimentation he learn that these small particles were negatively charged and about 2000 times smaller than the lightest element, hydrogen. This discovery showed that Daltons idea of solid indivisible objects must be wrong as Thomson correctly thought that theses small particles must come from within the atom. Because atoms are neutrally charged, Thomson came up with a model of that atom which had the negatively charged electrons in an atom surrounded by a cloud of positive charge. This model is often called the plum pudding model as the electrons can be though of a plums in the pudding which represents the whole atom.

This was the accepted model until Ernest Rutherford proved otherwise. This was done by his students who were experimenting by firing a beam of very small, positively charged particles, alpha particles, at a piece of gold foil. They expected the alpha particles to punch through the matter of the gold foil and become the repulsion of the positive charge spread throughout the atom. However, they found that not all of the alpha particles went through the gold and some bounced backwards. Rutherford came up with a new model of the atom to explain this, as most alpha particles were unaffected the positive charge in the atom must be concentrated in a very small volume. This explains the alpha particles repulsion as some will be very close to the nucleus and be repulsed. Rutherford came up with a model of a nucleus of positive charge surrounded by lots of empty space with the electrons orbiting in this space.

This was the accepted model until 1914 when Niels Bohr came up with the idea that the electrons exist in energy levels. This theory was proposed to explain why when heated atoms give off light. This was explained as when you heat the atom the electrons gain energy and then jump down an energy level and in doing so give off light.

Sources

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