

Difference Between Thomson and Rutherford Model of Atom

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Key Difference – Thomson vs Rutherford Model of Atom

The key difference between Thomson and Rutherford model of atom is that **Thomson model of atom does not contain any details about nucleus** whereas **Rutherford model of atom explains about the nucleus of an atom**. J.J. Thomson was the first to discover the subatomic particle called electron in 1904. The model he proposed was named as ‘plum pudding model of the atom’. But in 1911, Ernest Rutherford came up with a new model for the atom after his discovery of the atomic nucleus in 1909.

What is Thomson Model of Atom?

The Thomson model of atom is called **Plum pudding model** because it states that the atom looks like a plum pudding. The only known details about the atom at that time were,

- Atoms are composed of electrons
- Electrons are negatively charged particles
- Atoms are neutrally charged

Since electrons are negatively charged, Thomson suggested that there should be a positive charge in order to neutralize the electrical charge of the atom. The Thomson model of atom explains that electrons are embedded in a positively charged solid material which is spherical in shape. This structure looks like a pudding with plums embedded on it and was named as plum pudding model of atom. This proved the assumption that states an atom is neutrally charged since this model states the negative charges of electrons are neutralized by the positive charge of the solid sphere. Although this model proved that atoms are neutrally charged, it was rejected after the discovery of the nucleus.

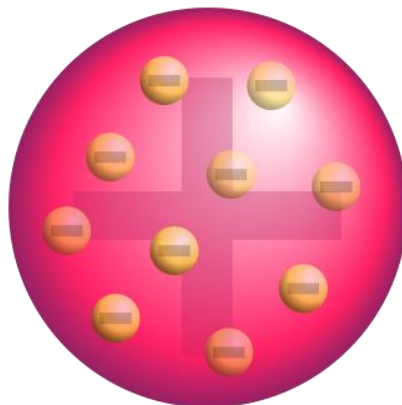


Figure 01: Thomson Model of Atom

What is Rutherford Model of Atom?

According to the Rutherford model of atom, the so-called plum pudding model of Thomson was incorrect. Rutherford model of atom is also called **nuclear model** because it provides details about the nucleus of an atom.

The famous experiment called “Rutherford gold foil experiment” led to the discovery of the nucleus. In this experiment, [alpha particles](#) were bombarded through a gold foil; they were expected to go straight through the gold foil. But instead of straight penetration, alpha particles turned into different directions.

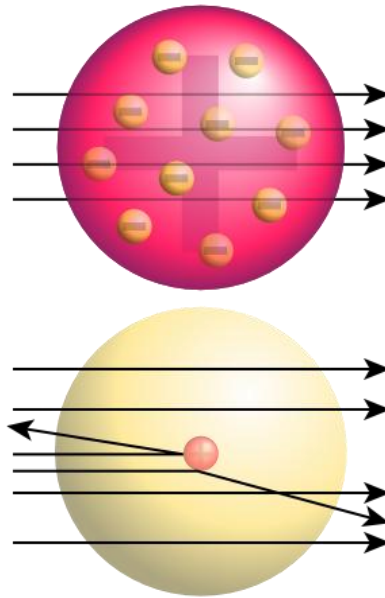


Figure 02: Rutherford Gold Foil Experiment

Top: Expected Results (Straight Penetration) Bottom: Observed Results (Deflection of some Particles)

This indicated that there is something solid with a positive charge in that gold foil which causes a collision with alpha particles. Rutherford named this positive core as the nucleus. Then he suggested the nuclear model for the atom; it was composed of a positively charged nucleus and negatively charged electrons surrounding the nucleus. He also suggested that electrons are in [orbitals](#) around the nucleus in certain distances. This model is also called **planetary model** because Rutherford suggested that electrons are located around the nucleus similar to the [planets](#) located around the sun.

According to this model,

- The atom is composed of a positively charged center which is called the nucleus. This center contained the [mass of the atom](#).
- Electrons are located outside the nucleus in orbitals in a considerable distance.
- The number of electrons is equal to the number of positive charges (later called [protons](#)) in the nucleus.
- The volume of the nucleus is negligible when compared to the volume of the atom. Hence most of the space in the atom is empty.

However, this Rutherford model of atom was also rejected because it couldn't explain why the electrons and the positive charges in the nucleus are not attracted to each other.

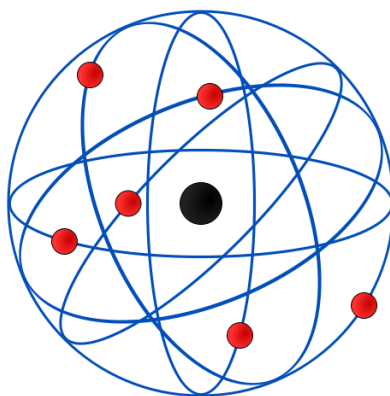


Figure 03: Rutherford Model of Atom

What is the difference between Thomson and Rutherford Model of Atom?

Thomson vs Rutherford Model of Atom

Thomson model of atom is the model which states that electrons are embedded in a positively charged solid material which is spherical in shape.

Rutherford model of atom is the model which explains that there is a nucleus in the center of the atom and electrons are located around the nucleus.

Nucleus

Thomson model of atom does not give any detail about the nucleus.

Rutherford model of atom provides details about the nucleus of an atom and its location inside the atom.

Location of Electrons

According to Thomson model of atom, electrons are embedded in a solid material.

Rutherford model says electrons are located around the nucleus.

Orbitals

Thomson model of atom does not give details about orbitals.

Rutherford model of atom explains about orbitals and that electrons are located in these orbitals.

Mass

Thomson model of atom explains that the mass of an atom is the mass of positively charged solid where electrons are embedded.

According to the Rutherford model of atom, the mass of an atom is concentrated in the nucleus of the atom.

Summary - Thomson vs Rutherford Models of Atom

Thomson and Rutherford models of atom were the earliest models to explain the structure of an atom. After the discovery of the electron by J.J. Thomson, he proposed a model to explain the structure of the atom. Later, Rutherford discovered the nucleus and introduced a new model using both electron and nucleus. The main difference between Thomson and Rutherford model of atom is that Thomson model of atom does not contain any details about nucleus whereas Rutherford model of atom explains about the nucleus of atom.

Reference:

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