HEATER AND STIRRER

HEATER:

Heater: is a device used in scientific and industrial settings to provide controlled heating for various applications in the flasks or beakers, such as sterilization, heating solutions, sample preparation, and chemical reactions.

Types of Laboratory Heaters:

1. **Large floor-standing heaters**.
2. **Compact and Repetitive Heaters**.
3. **Specialized Heaters**.

They are essential for ensuring precise temperature control, efficiency, and safety in laboratory environments.

Applications in laboratories:

1. **Sterilization**: To ensure that experiments are conducted in a contamination-free environment.
2. **Sample Preparation**: To heat samples to specific temperatures for analysis.
3. **Chemical Reactions**: Many chemical reactions require precise temperature control, which laboratory heaters provide.

Advantages of using laboratory heaters:

1. **Precision**: Provides accurate temperature control, ensuring reliable and reproducible results.
2. **Efficiency**: Reduces processing time and energy consumption compared to manual heating methods.
3. **Versatility**: Suitable for a wide range of applications, from sterilization to chemical synthesis.

HEATING MANTLE

Heating Mantle: is a device used in laboratories to heat certain media such as organic liquids in beakers or flange glass vessels. Due to the various sizes of the glass vessels, the exact amounts of liquids which are necessary can be heated.

Advantages of using laboratory heating mantle:

1. Temperatures of up to +450 °C (842 °F) are possible.
2. The heat-up time is very short.
3. The heat is distributed very evenly.

Types of heating mantles:

1. The heating mantle with a fixed housing.
2. The heating jacket.

STIRRER:

Stirrer: is effective and easy machine to mix or disperse fluids in a container and provide superior mixing performance. It can be used for various applications such as cell lysis, protein purification, chemical synthesis, or sample processing.

It consists of several components: an electric motor with a stirring shaft and a base that holds the motor and the stirring impeller.

There are mostly 3 laboratory stirrers: **magnetic stirrers**, **overhead stirrers**, and **hot plates**.

1. Magnetic Stirrer: is the most commonly used laboratory stirrer and is typically used in chemical or pharmaceutical laboratories to mix small volumes of liquids such as solutions or suspensions.

It is best suited for low-viscosity fluids and operate with minimal noise.

Principle:

They work by placing a stirring bar inside the container and activating a magnetic field that causes the stirring bar to rotate rapidly. This creates fluid motion, which helps mix or homogenize the container's contents. The motor has a magnet for producing electromagnetic fields. Another magnet is placed inside the liquid, which causes the stirring bar to move.

2. Overhead Stirrer: is designed for heavier mixing tasks that require greater stirring power than what is provided by magnetic stirrer.

An overhead stirrer is necessary when working with higher-viscosity liquids and harsh chemicals as it can handle more extreme conditions than a regular magnetic stirrer.

Principle:

It work by placing a stirring bar inside the container and activating an electric motor rotating the stirring bar at high speeds. This creates much more powerful fluid motion, which helps in quickly dispersing or homogenizing even very viscous liquids.

3. Hot Plate Stirrer (hot plate magnetic stirrer): is used for mixing and heating or maintaining a constant temperature for aqueous solutions for many reactions such as synthesis.

The maximum reachable fluid temperature depends on the size of the flask, the quantity of solution to be heated, the power of the heating element, and amount of insulation provided to the system.

The advantages of the hot plate:

1. Uniform and controlled heating.
2. Safety.

Today's hotplate come in two designs:

1. Analog plate is controlled with a rotating dial.
2. Digital hot plate typically gives better temperature control.

Principle:

It consist of a flat, insulated surface on which an electric current is applied to produce heat.

Hot plate magnetic stirrer require a magnetic stir bar to put into a solution to effectively mix the solution during heating. Hence having a digital hot plate and magnetic stirrer allows for a more uniform and controlled environment for the solution.

When it comes to materials, hot plates can be made from ceramic, aluminum, or enamel. An aluminum plate can distribute heat evenly, quickly, and efficiently. It is also easy to clean and maintain but does have a tendency to corrode. Ceramic and enamel are considered more conditioned to handle temperature fluctuations as well as resist strong chemicals.

DROP MELTING POINT APPARATUS

Drop Melting Point Apparatus: Is a heating device with metallic case structure painted with anti-acid products with electronic regulator and main switch, used to measure the melting point (the temperature at which a solid substance transforms into a liquid state).

Accurate melting point determination is crucial for ensuring the quality and purity of substances.

Principle:

1. The finely powdered or crystalline sample is placed in a small capillary tube.
2. Insertion of capillary tube inside the melting point apparatus.
3. The apparatus is equipped with a heating element, often an electrical coil or a hot plate
4. At a certain temperature, the substance begins to melt, transitioning from a solid to a liquid state (melting point).
5. Pure substances have a specific and sharp melting point, meaning they transition from solid to liquid over a narrow temperature range. Impurities or mixtures tend to lower and broaden the melting point range.
6. Cooling and Cleaning.