**National Institute Of Technology, Raipur**

# Term-Project-Report

on

# "MICROTOME"


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**- Rajnish Kumar**

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# Abstract

In this report, we gather information related to microtomes. A microtome is a histopathology instrument. It makes of a Greek word which means cutting tool. We also studied the parts of the microtome and their functioning which makes it too useful. It has several types which work differently but their function are the same. It has lots of advantages. So let's study them one by one about microtome.

# Contents

# 1 Introduction

A microtome is a cutting tool that is used to generate extremely thin slices of material called sections (from the Greek mikros, which means "small," and stay, which means "to cut"). Microtomes are essential in science because they are used to prepare samples for inspection under transmitted light or electron radiation in microscopy.

Depending on the specimen to be sliced and the desired thickness of the pieces to be cut, microtomes use steel, glass, or diamond blades. Histological sections of animal or plant tissues are cut using steel blades for light microscopy. Light microscopy sections are cut with glass blades, and electron microscopy sections are cut with very thin glass blades.

Industrial-grade diamond knives are used to slice hard objects like bone, teeth, and stiff plant matter for light and electron microscopy. Gem-quality diamond blades are also used to slice tiny sections for electron microscopy.

Microtomy is an alternative to electropolishing and ion milling for preparing thin portions of materials such as bones, minerals, and teeth. With section thicknesses ranging from 50 nm to 100 nm, microtome sections can be created thin enough to section a human hair across its width.

# 2 Importances

The following are the most prevalent uses for microtomes: Histology as it is known today Tissues are preserved, dehydrated, cleared, and embedded in melted paraffin, which hardens into a solid block when cooled. After that, the tissue is cut in the microtome at thicknesses ranging from 2 to 50 m. Microtomes are used to slice thin slices of material, which are referred to as sections. In microscopy, microtomes are used to prepare samples for viewing using either transmitted light or electron radiation.

# 3 Types of Microtome

We have different types of microtome according to need. some microtome is very specific for uses purpose.
follow as:-
1 Sledge
2 Rotary

3 Cryomicrotome
4 Ultramicrotome
5 Vibrating
6 Saw
7 Laser

## 3.1 Sledge

A sledge microtome is a device that places the sample in a fixed holder (shuttle) that goes back and forth across a knife. The sled in modern sled microtomes is mounted on a linear bearing, allowing the microtome to cut multiple coarse sections quickly. The pressure delivered to the sample during the cut can be lowered by altering the angles between the sample and the microtome knife. The preparation of big samples, such as those encased in paraffin for biological preparations, is a typical use for this form of microtome. On a sledge microtome, typical cut thickness ranges from 1 to 60 micro meter.

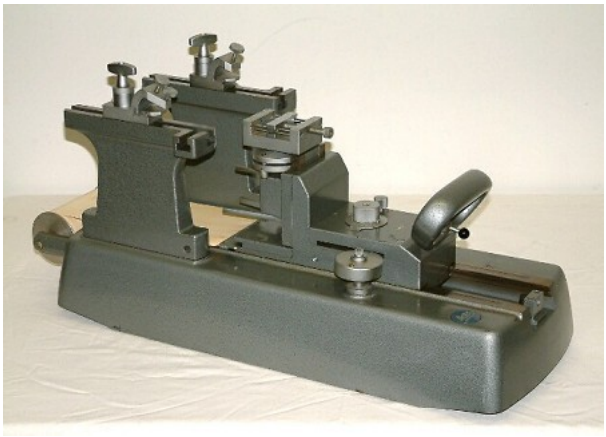

Figure 1: Sledge Microtome

## 3.2 Rotary

This device is a standard microtome design. The actual cutting is part of the rotational motion in this device, which uses a staged rotary movement. The knife in a rotary microtome is usually set in a vertical position.

Figure 2: Rotary Microtome

Cutting a rotating microtome using the principle of sample movement The sample is cut by the knife from position 1 to position 2 by the action of the sample holder, at which point the fresh section remains on the knife. The sample holder is advanced by the same thickness as the section to be created at the highest point of the rotational motion, allowing the next section to be made.

## 3.3 Cryomicrotome

Many rotating microtomes can be converted to cut frozen samples in a liquid-nitrogen chamber, resulting in a cryomicrotome configuration. The lower temperature allows the sample's hardness to be increased, such as by experiencing a glass transition, allowing semi-thin samples to be prepared. To maximize the final sample thickness, the sample temperature and knife temperature must be regulated.

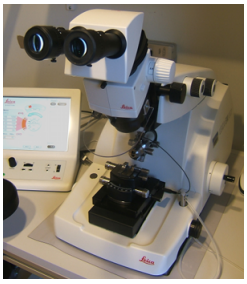

Figure 3: Cryo Microtome

## 3.4 Ultramicrotome

The main tool used in ultramicrotomy is an ultramicrotome. It enables for the creation of exceedingly thin sections, with the instrument operating similarly to a rotational microtome but with very strict mechanical tolerances. The linear thermal expansion of the mounting is used to give very precise control of the thickness as a result of the thorough mechanical construction.

Figure 4: Ultra Microtome

## 3.5 Vibrating

The vibrating microtome works by cutting with a vibrating blade, which allows the final cut to be done with less pressure than a stationary blade would. The vibrating microtome is typically employed for biological samples that are difficult to work . The cut thickness for live tissue is usually 30–500 micrometres, while it is 10–500 micrometres for fixed tissue.

Figure 5: vibrating Microtome

## 3.6 Saw

saw microtome is aslo type of sledge microtome .For hard materials like teeth and bones, the saw microtome is very useful. This type of microtome uses a recessed spinning saw to cut the material.The cut thickness is roughly 30 micrometres, which allows for big samples.

Figure 6: Saw Microtome

### 3.7 Laser

A laser microtome is a device that allows you to slice without touching anything. There is no need to prepare the material beforehand by embedding, freezing, or chemical fixation, which reduces preparation artefacts. This microtome design may also be used to cut very hard materials like bones and teeth, as well as some ceramics. The thickness achieved varies between 10 to 100 micrometres, depending on the sample material's qualities.

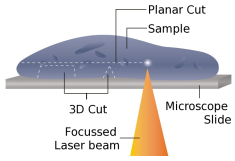


Figure 7: laser microtome

## 4 Conclusion

After collecting the data about microtome we come to know that microtome is very useful. As we cut tissue by use of a surgical blade then why do we use microtomes? Because its cuts slices uniformly. A clear understanding of the normal structure of the tissue sample is essential for interpreting the changes that occur in the tissue sample during the disease. Some disease tissue is very difficult to evaluate and required meticulous dissection. Hence, microtome instruments are used to cut biological specimens into uniformed thin sections for a detailed microscopic examination. For growing awareness about early diagnosis of chronic diseases and increasing demand for technically advanced diagnostic equipment are the major factors that drive the growth of the automated microtome.

## 5 Reference

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