



Basic Techniques for Embedding and Sectioning Plastic Materials

Due to the increasing number of industrial applications for microtomes, it becomes more and more important to know how to section the different kinds of plastic materials.

Decision-making, which microtome should be used for which kind of application, is not an easy job and mainly based on a great deal of experience.

The choice of the appropriate microtome is determined by the size of the specimen and by the hardness of the material to be cut. Therefore, these basic parameters have to be checked first.

From the variety of clamping systems / specimen holders that are available, the very best combination has to be found that gives the best results as far as stability is concerned.

Generally, not in all cases it is necessary to embed the sample for sectioning. For hard foils or plastic components, the foil clamping system, which does not require embedding, can be used for instance. That means, if the specimen is stable enough and a direct clamping device is available, it can be mounted in the specimen holder without additional embedding. Otherwise, the specimen / sample has to be embedded to increase the overall stability of the sample.

The choice of the embedding material depends on the specimen type and the customer's sectioning requirements, including sample treatments after sectioning, such as staining.

In most cases, samples of a maximum size of 1.5 cm have to be prepared using a microtome. In this case, one of the rotary microtomes mentioned above will be the instrument of choice.

When sectioning very hard or large samples, the rotary microtomes may not be the right system to obtain high quality sections. In this case, a heavy duty microtome for large and hard sections can be used. The LEICA SM 2500 - series features very high cutting forces and special knife holders designed to achieve maximum stability. As the maximum cutting force of a rotary microtome is limited, the hardness of MMA for instance is the upper limit that allows the use of a rotary microtome for sectioning hard materials.

The most suitable kind of microtome and specimen clamping, knife holder and knife have to be chosen.

For sectioning soft materials, knives with a small wedge angle are suitable. For hard materials, it is just the opposite. Choosing the optimal knife angle depends directly on the customer's experience.

From a practical point of view, it has to be mentioned that the majority of plastic materials can be cut best at knife angles between 20 and 45 degrees celsius, The clearance angle to be selected on the knife holder should be around 5 to 10 degrees celsius and must be tested prior to routine serial sectioning.

In most cases, tungsten carbide knives or tungsten carbide disposable blades (TC 65) are successfully used for plastic sectioning. For very small samples, usually glass knives are recommended, as they produce higher quality sections when cutting below 1 microns. An even better quality section could be achieved by using a diamond knife.

After having prepared everything according to the above mentioned details and sectioned the material, one major problem still remains unsolved: removing the sections from the knife. Needless to say that section removal requires a lot of skill and experience. Due to the fact that sections tend to curl during sectioning, it might be helpful to guide the section using a small brush or carefully with a needle or forceps. In some cases, the tape method can be extremely helpful to prevent sections from rolling.

Tape method means that a tape is applied directly onto the block surface prior to sectioning. After sectioning, the sections sticks on the tape. Please note that you should use a special tape to avoid intensive colours of the tape itself in

polymerized light.

If the use of embedding medium, e.g. xylene, on glass slides is planned, it has to be ensured that the plastic material is not soluble in the mounting medium, otherwise, the sample is damaged using this method. If xylene cannot be used, different kinds of oils can be suitable alternatives. To produce permanent slides, the section has to be protected from oxygen with a cover slip.

The appropriate cutting temperature is a very important factor in sectioning plastic materials. Especially low temperature sectioning is very common. If it becomes necessary to cut at low temperatures, the Liquid Nitrogen Attachment Leica LN 21 can be used. The Liquid Nitrogen Attachment is of particular importance to cut elastomers and thermoplasts which cannot be sectioned satisfactorily at ambient temperature but only below - 100 degrees celsius.

Leica Microsystems Nussloch GmbH, Postfach 1120, Heidelberger Straße 17-19, D-69226 Nußloch, Germany,
Phone: +49-6224-143-0, Fax: +49-6224-143-200,
e-mail: 101776.3346@compuserve.com