

# Physical Metallurgy and Metallography Laboratory

(course code: MM205)

## Laboratory Report

### Experiment - 4

## Hot and Cold Mounting of Specimen.

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### Cold Mounting :-

#### Procedure:-

- Adjust the vacuum to maximum and pump down the chamber.
- Place the tubing on the metal stand and tighten the knob.
- Tighten stopper and knob to pump down to reach about 400 mbar.
- Allow the vacuum to hold for about 5 minutes

#### preparation and pouring epoxy over the specimen:

- Prepare epoxy compound with 20 ml of epoxy resin and 5 ml of hardener. Stir slowly for 6 minutes to reduce the formation of bubbles.
- Place tubing into epoxy compound and release the knob to allow epoxy to flow (try to not release any bubbles to the mould).
- After the addition of sufficient epoxy, tighten the knob to stop the flow of epoxy.
- Adjust the vacuum to minimum and wait for 30 minutes.

#### obtaining the mould:

- Vent the chamber and remove the mould with the sample inside and leave it to harden for 8 hours before removing the cold mount from the mould.

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### \* Epoxy resins:

Epoxy resins are suitable for mounting of all types of materials and are especially recommended for vacuum impregnation.

Epoxies have the lowest shrinkage of all cold-mounting resins.

The curing time is relatively long but adhesion to most material is excellent. They polymerise through a chemical reaction after being mixed in the correct proportions. The hardened epoxy is duroplastic and not affected by moderate heat or chemicals. Sturmer's epoxy system consist of two components a resin and a curing agent/hardner properties such as low vapour pressure, transparency, good adhesion, low viscosity and no shrinkage are all specific to epoxies. As the stoichiometric resin hardner ratio is critical; both parts should be weighed to obtain the best mounting results. If it is only possible to measure the amount by volume.

### \* Acrylic resins:

Acrylic are easy-to-use resins with short curing time, very limited shrinkage and excellent mounting properties. They are well suited for both serial mounting of irregularly shaped specimen and for routine work. Acrylics are available with and without a mineral filler.

Resins:-

Suppliers: STRUERS

<u>Resin</u>	<u>Material</u>	<u>Curing-time</u>
Epofix	Epoxy	12 hours
Prontofix	Epoxy	90 mins
Specifix-40	Epoxy	3.5 hours at 50°C
Caldofix-2	Epoxy	1.5 hours at 75°C
Levocit	Acrylic	20 mins
Versocit-2	Acrylic	10 mins
Durocit-3	Acrylic	30 mins
Carocit	Acrylic	20 mins
Vlafix	Acrylic	20 mins

Hot Mounting:-Procedure:-

- Switch on the hot press mount.
- Apply anti-stick stearate powder to the surface of lower ram and upper ram to avoid sticking of resin.
- Place the specimen on the ram with the surface to be viewed facing downwards.

pouring resin over specimen:

- Bring down the ram to its lower limits and fill a suitable amount of resin about 1 big scoop into the cylinder through the funnel.

installing the top closure:

- place the closure with the upper ram on the mounting cylinder



and press it down and turn it clock wise until its lower limit,

parameters before starting the mounting process:

- Check the above table for the correct resin specifications and adjust them accordingly.
- Press start, the machine will automatically start and relieves the pressure when the cooling time has elapsed.

Removing the top closure and obtaining the sample:

- Turn the top closure counter clock-wise until it released from the thread.
- Raise the lower ram to its upper limit
- Remove the sample and switch off the hot press mount.

#### \* Thermosetting Resins:

Thermosetting resins cure at elevated temperature. To avoid porous, non-uniform mount it is important that the pressure is always constant and at the right level. Once the mount is cured, the only way to remove the specimen to destroy the mount.

#### \* Thermoplastic Resins:

Thermoplastic resin melt at elevated temperature and harden during cooling. This resin type can be used to mount pressure sensitive specimens. The mounting medium is 1<sup>st</sup> heated and then exposed to force when it is soft. This ensures that the mounting medium is pressured into open pores and cracks. Thermoplastic mounting media can be melted again.

### Advantages of Hot and Cold Mountings:-

Hot mounting	Cold mounting
<ul style="list-style-type: none"> <li>→ Reduce the problem of edge rounding</li> <li>→ quick process</li> <li>→ more economical</li> </ul>	<ul style="list-style-type: none"> <li>→ Used for specimen that may be damaged by heat/press.</li> <li>→ suitable for irregular shaped specimens also</li> <li>→ less economical.</li> </ul>

### Disadvantages of Hot and Cold Mountings:-

Hot Mounting	Cold mounting
<ul style="list-style-type: none"> <li>→ Radical cracking</li> <li>→ Shrinkage</li> <li>→ Blistering</li> <li>→ Bulging</li> <li>→ Porosity</li> <li>→ voiding within large mounts.</li> <li>→ Dull surface finish.</li> </ul>	<ul style="list-style-type: none"> <li>→ Air bubbles along the sides of specimen.</li> <li>→ Discoloration</li> <li>→ Sticky/rubbery surface</li> <li>→ High shrinkage</li> <li>→ Slow process</li> <li>→ No adhesion between epoxy &amp; specimen when epoxy resins are used.</li> <li>→ Indraft / suction at the bottom of the specimen.</li> </ul>

\* Environmental hazards while using cold mounting resins:-

→ Epoxy resins are dangerous.

It acts as irritant, which can cause toxic eczema.

Sensitizer which can cause allergic, contact dermatitis.

→ Resins are highly toxic

→ Resins are not biodegradable and do not decompose.

→ So they can pollute earth's crust and water.

→ These resin can also damage ozone layer.