

## Ultra Bed Low Viscosity Epoxy Kit

#E14310

### A Modified Spurr's Formula for Biological, Material and Mineralogical Specimen

#### Background:

The introduction of Spurr's<sup>1</sup> Resin in the early 1960's provided electron microscopists with a very low viscosity resin that gave exceptional penetration qualities. The viscosity of the Spurr resin formulation at 60cps is much lower than other epoxy resins. It readily penetrates membrane walls, hard tissue, rocks and other minerals. It has been used successfully in the preparation of specimen with high lipid content, tissues with hard lignified walls and highly vacuolated parenchymatous tissue<sup>2</sup>.

Spurr resin is based on a four-component mixture. The original formulation was established on a Union Carbide (now Dow Chemical) product, ERL-4206 or VCD. This product is no longer available and has been substituted with ERL-4221. ERL-4221 has worked well, but is significantly higher in viscosity than ERL-4206. High initial viscosity can be detrimental in protocols for geological samples dried by a vacuum displacement process. Dense biological specimens often require a low viscosity resin for adequate penetration during infiltration. While a four-part system offers some latitude in controlling or altering the properties of the resin, it takes more time and opens up room for greater error and inconsistency. This can result in loss of valuable specimen.

EMS's new UltraBed Low Viscosity Epoxy Kit consists of two very low viscosity (~65cps) liquids, which are mixed in equal parts by weight. The mixed components build slowly in viscosity over a 48-hour period to about 500cps. The material cures to a hard solid overnight at 60°C or in about 10 hours at 70°C. Thin sections may be cured fast at higher temperatures, however there is the possibility of the material darkening due to higher exothermic temperatures.

The new UltraBed Low Viscosity Epoxy Resin provides the same results as the original Spurr Low Viscosity Resin with a number of advantages.

- Clear blocks enable easy tissue location.
- Easy to Use- mix only 2 components in equal proportion
- Save Time – use same solution for both infiltration and embedding
- Convenient – mix only the amount you need
- Less Hazardous – components shipped together as non-hazardous materials
- Stable – product has excellent shelf-life stability (2 years)

#### Fixation:

Specimens can be fixed in formaldehyde (Paraformaldehyde) and Glutaraldehyde solutions as required by the laboratory. Post fixation in osmium Tetroxide can be completed prior to infiltration. Non-biological specimens may not require a fixation step.

**Dehydration:**

Dehydration must be completed for all specimens. Failure to do so will result in unpolymerized portions of the block. The specimens can be dehydrated with Ethanol or Acetone to 100% to remove moisture. Propylene Oxide is not required for dehydration. The time required for each dehydration step will depend on the size of the specimen and laboratory protocol.

Mineralogical and material science specimens may require only drying prior to infiltration and embedding procedures.

**Mixing & Infiltration:**

The UltraBed Low Viscosity Epoxy Resin is used for both infiltration and embedding. To prepare the UltraBed Resin, mix together equal parts, by weight, of UltraBed Solution A and UltraBed Solution B. For example, mix 2gms of UltraBed Solution A with 2gms of UltraBed Solution B. Because the components in the UltraBed Low Viscosity Epoxy Kit are mixed one to one, mix only the amount required as needed.

The UltraBed Resin can be divided for infiltration with mixtures of the final dehydrant. Infiltration for dried specimen can be started directly with UltraBed Resin. These steps are generally 10 minutes to several hours dependent on specimen type and size.

1. 1 part UltraBed Resin to 3 parts dehydrant
2. 1 part UltraBed Resin to 2 parts dehydrant
3. 1 part UltraBed Resin to 1 part dehydrant
4. UltraBed Resin alone will be a minimum of two changes to replace any excess dehydrant in the specimen. The final step in UltraBed Resin should be several hours to overnight.

**Embedding:**

The specimen can be removed the last step of infiltration and oriented in the mold of choice. Once the specimen is in the correct orientation, fill the mold with UltraBed Resin. If embedding in BEEM® capsules or small molds, polymerize overnight in a 60°C oven. Additional time will be required for larger specimen. If the block does not appear to be completely polymerized, it can remain in the oven for the time required to harden the block. The temperature can be raised to 70°C, although increased temperature may darken the blocks.

**Sectioning and Staining:**

Sectioning is completed as usual with glass, diamond or tungsten carbide knives. The sections can be placed on a slide for staining and block orientation or on grids with the appropriate stains for electron microscopy. Lead citrate and uranyl acetate can be used with excellent results.

**Caution:**

Do not get on skin, clothing or in eyes. Avoid inhalation of vapors and mists. In the case of contact with eyes or skin, flush immediately with copious amounts of water for at least 15 minutes; for eyes get immediate medical attention. Remove contaminated clothing and shoes at once. This product should be used under a hood at all times during the infiltration and embedding process. The oven required for polymerization should be under a hood or have adequate ventilation. Wear gloves and safety glasses when handling these components. Wash hands immediately after handling.