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MPS-M23B

Room-Temperature Curable Microcellular Foam (Polyether/Polyester Hybrid)

This foam polyurethane formulation is designed to yield closed-cell microcellular foam by either hand-mixing or machine casting method at room temperature. The components are liquid at room temperature. It is designed to be used in compression molding process with 10% or higher compression rate. For a small quantity, this can be batched manually by hand tools. This can also be cast with a multi-component meter-mixing/dispensing machine. The free-rise density of the foam is 23 pounds-per-cubic-foot.

Component Properties

	Prepolymer (A)	Curing Agent (B)
Code Number:	MSA-018	PBD-025
Specific Gravity:	1.183	1.025
Equivalent Weight:	183	283
%NCO	23 %	n/a

Mixing Ratio

	(Part-A)	(Part-B)
Weight Ratio:	1.000	1.500
Volume Ratio:	1.000	1.762
Stoichiometry NCO/OH:	1.000	0.970
NCO Index	1.031	1.000

*Mixing ratio can vary within 3-5 %. Higher ratio of part-B will make it slightly more flexible. Always calibrate your meter mixing equipment before use.

Processing Temperature:

Part-A	Ambient
Part-B	Ambient
Mold/Substrate	100 – 120 °F

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* The ideal temperature for the mold and substrate is 100 - 110 ºF. However, if you are using plastic mold, the mold may not need to be heated. For all metal molds, the temperature needs to be between 100 to 120 ºF.

Cure Pattern:

Mixing time	10 seconds minimum by hand batch
Pot life (pour within)	45 seconds
Demolding time	15 - 20 minutes with mold temperature 110 °F
Complete Cure Cycle:	48 hours at room temperature

Recommended Processing:

We recommend testing small amounts to see how the material behaves, and then develop your casting method accordingly. When you batch, please be sure to operate in a well-ventilated area or large open area with a good air circulation, wear rubber gloves, long sleeves, and protective eyeglasses to avoid skin/eye contact. Read the enclosed Material Safety Data Sheet for details on the safety and handling.

Before you start your test, there is a chance the materials being frozen during the transportation when the weather is cooler. This may cause separation of the constituents within the components. If in such case, you need to agitate the components in the cans. If MSA-018 arrives with some gel-like material in the container, it is likely the material has been exposed to some low temperature. In this case, heat the content to 140 – 160 °F and stir to re-blend the material in the container. You may use a drum mixer at medium speed for 15 to 20 minutes to agitate the material in a drum. After re-blending, keep it at a room temperature above 72 ºF. MSA-018 will not freeze at room temperature.

For small samples: Do not open the can for part-A (MSA-018) until you are ready to use as it is a moisture sensitive material. Lightly shake the unopened can to agitate the content. You can open the can for part-B (PBD-025) and use a metal spatula or knife (or something dry, strong, and clean) to agitate. Do not use wooden paint stick as it has moisture within, it may contaminate the material.

The part-B component (PBD-025) contains some constituent that can be separated to layers during storage. The content needs to be agitated before dispensing each time.

The suggested small quantity test procedure follows:

- Pre-heat the mold and substrate to between 100 and 120 ºF if needed.

- Apply mold release into the mold if needed. Do not use silicone-base mold release as it destroys the foam surface.

- Calculate the total inside volume of the mold (or the finished part volume) in cubic feet. Divide it by the free rise density. This will give you the weight in pounds of the component mixture at the free-rise density. Multiply by 1.1 for 10 % compression rate. (See below for

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compression molding). This will give you the total weight for the two components. Use the specific gravity data above to calculate the volume ratio if needed.

- Take the correct ratio of part-A and part-B into a mixing cup. Mix well with a steel or plastic stir-stick for at least 20 seconds. Agitate vigorously and thoroughly. Scrape the material off the side and bottom of the cup as you mix.

- Cast the mixture into the mold and close the mold. The mold should be between 100 and 120 ºF if using a metal mold. The material may not cure properly if mold is too cold. (Plastic mold may not need to be heated.) If the temperature of the mold is too high, it may cause defect on the foam surface.

- Cure in the mold for about 10 – 15 minutes before demolding. Check the strength of the foam surface before demolding. Larger parts may demold faster. Experiment to find the optimum de-molding time.

- The foam cures at room temperature gradually for about 24 to 48 hours to yield the final physical properties that are good to be used in the application.

<u>Compression Molding</u>

Foam needs to fill the mold space by put slightly larger amount of foam into the mold. The expansion pressure of the foam sends the foam material to fill the mold. The mold therefore needs to be a close mold and has to have some capacity to retain the expansion pressure. The simplest mold will be just an open-top box with a lid. The lid then needs to be clamped to hold the pressure. The air trapped on the top side of the mold could make a large void if it is not released. For this purpose, you need to have a very small vent (hair vent) to let the trapped air escape from the mold.

The mold material can be metal, plastic, or elastomeric material. Mold surface needs to be slick as foam could stick to any porous surface. Metal molds tend to absorb the heat. Heat created from the chemical reaction is required for foam to cure. If mold is cold, this heat is absorbed and the foam does not cure properly. The mold needs to be heat to 100 to 120 ºF in case of metal molds if metal mold. If your mold is plastic or elastomeric mold, this may not be necessary as those materials retain heat better than metal molds.

Compression rate indicates how much more of component material is put into the mold. The rate indicates the percentage of excess amount of material to the amount in which to fill the mold using the foam's free-rise density. Typically, about 10 % compression should give enough pressure to distribute the foam within the mold. Using higher rate makes the foam denser and stronger.

<u>Shrinking problem for closed-cell microcellular foams and semi-rigid foams:</u>

Polyurethane foam uses a chemical reaction within the components to create carbon dioxide as a source of foaming. Because the gas is hot when it is created, it contracts when the foam is cooled to the room temperature. Closed cell foam with flexibility can shrink together with this contracting gas as it cools. The compression molding method gives outward pressure to the gas in foam cells to compensate this shrinking force. If your foam shrinkage is too much, try increasing the compression rate to compensate. (This does not apply to open-cell foams and rigid foams.)

Applications with fire-retardant grade

This foam is not fire-retardant grade foam, and it is not recommended for applications, which require or should be using fire-retardant grade materials. The applications such as automotive interior, building material, and components for some electronic parts often require fire-retardant grade materials and it may be regulated by laws. It is the user's responsibility to conform to the applicable regulations. We also do not recommend this foam to be used in the applications in which the foam can be exposed to high temperature or being near an ignition source.

By adding fire retardant additives, this foam may be modified to a fire-retardant grade foam. The user must test the foam modified with the fire retardant additives for the fire-retardant property and the conformance to the applicable regulations. Contact Northstar Polymers for source information for fire retardant additives.

Deflection Temperature For Structural Foams

All semi-rigid foams soften as operating temperature rises. If load bearing capacity is required at an elevated temperature, test the structural integrity of the foam parts at the expected operating temperature for the application.

Storage and Handling Information:

Part-A component (prepolymer) contains isocyanate component, which is very much sensitive to moisture. If it is left in air, part-A will react with atmospheric moisture and ruined. This reaction is non-reversible. Soon after opening a can and dispensing the content, nitrogen gas or negative-40-degree-due-point dry air needs to be injected to the can to blanket the material. Silica gel or calcium chloride desiccant filter should be installed to 55 gallon drum-vent for your drum feeding system. The storage temperature should be at a room temperature between 65 and 90 °F. When part-A component material is reacted with a large amount of water, it may create a violent chain reaction, which could even start fire. This material must be stored indoor where there is no chance of contact with a large amount of water.

Sometimes when the containers are opened many times during the storage, small amount of moisture comes into the container and start to react with the component. This contaminated (reacted) byproduct is usually heavier than the rest of the material. So, old material may have a settlement of this bi-product at the bottom of the container. This bi-product settlement is often thicker and cloudier. Do not mix-in this settlement. Avoid using the settlement at the bottom of an old container.

The storage temperature for both part-A and part-B should be at a room temperature between 72 and 90 °F.

Generally, all constituents of the part-B material are compatible and stay blended in homogeneously. However, if the material is stored for a long time, some constituent may start to separate. It is a good practice to agitate the container before dispensing if you have stored the material for a long time without movement. Avoid moisture and enfolding excess air when agitating.

Safety:

The component materials are industrial-grade chemicals. Please keep them in a secure place and prevent access from any unauthorized individual. The personnel who handles these materials needs to read the Material Safety Data Sheet (MSDS) for detail information on safety and handling of the material. The MSDS for each component is sent with the shipment of the material.

When conducting a test or producing your parts using this material, be sure to operate in a wide-open area with good air movement, or in a well-ventilated area. Wear rubber gloves, long sleeves, and protective eyeglasses to prevent skin/eye contact of the material. When your operation involves heating or spraying of the material, we recommend, in addition to the above, installation of a proper ventilation system and using a half-face respirator recommended for the use to prevent inhalation of the fume.

Direct contact of polyurethane raw materials to skin/eye, as well as ingestion may lead to health problems. No eating or smoking should be permitted at the working area. The operator should wash hands well with soap and water after handling the materials. Please refer to the MSDS for each component for the detailed health information.

Possible Freezing:

When part-A material is exposed to a low temperature; the constituent material may freeze and separate within. During the cold seasons, the material may arrive frozen after traveling in a cold truck. If you see gelling within the material after the material has arrived, it is likely the material has been frozen. If the material has had a chance to be frozen, you need to thaw re-blend. Heat the container so that the content is about 140 °F, then agitate content gently to re-blend before dispensing any from the container. Part-B material has less chance of freezing or separation.

For any questions, please contact Northstar Polymers.

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