



Northstar Polymers (Div. of Tandem Products, Inc.)
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MCP-V40A

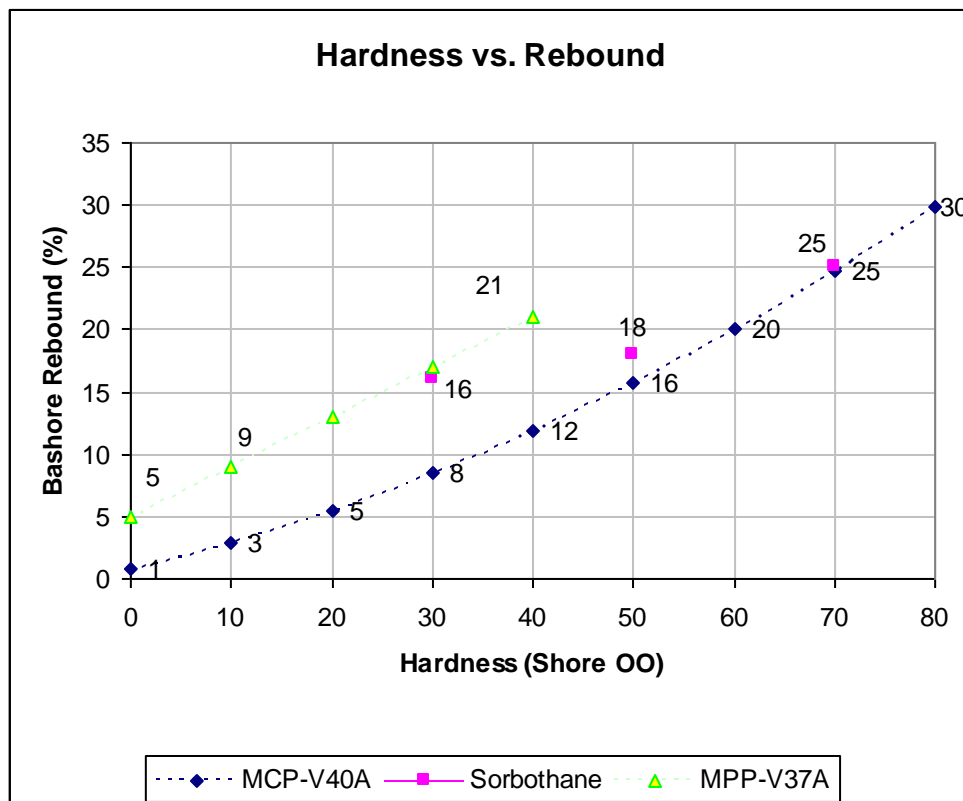
OO Scale Low Rebound Gel

MCP-V40A is one of our polyurethane gel formulations specifically designed for padding and cushioning applications, where low rebound property of the material is critical. This viscoelastic polymer is a two-component urethane casting system, which can easily be processed to make variety of products in various vibration-dampening, shock absorbing, and cushioning applications.

The impact absorption property can be represented by rebound property of the material. The chart below shows Bashore Rebound test data in comparison with well-known vibration dampening material marketed by Sorbothane as well as our standard polyurethane gel formulation MPP-V37A.

Polyurethane gel class polymers in general are made in such way that user can easily control the hardness of the product by simply changing the mixing ratio of the same combination of the two component materials. This means MCP-V40A and other polyurethane gel systems can be used in a range of applications, which require different hardness.

Typically in polyurethane gel formulation systems, softer materials made with ratio adjustment of the same pair of two components have lower rebound property. The chart shows the rebound property changes of the three different formulations.

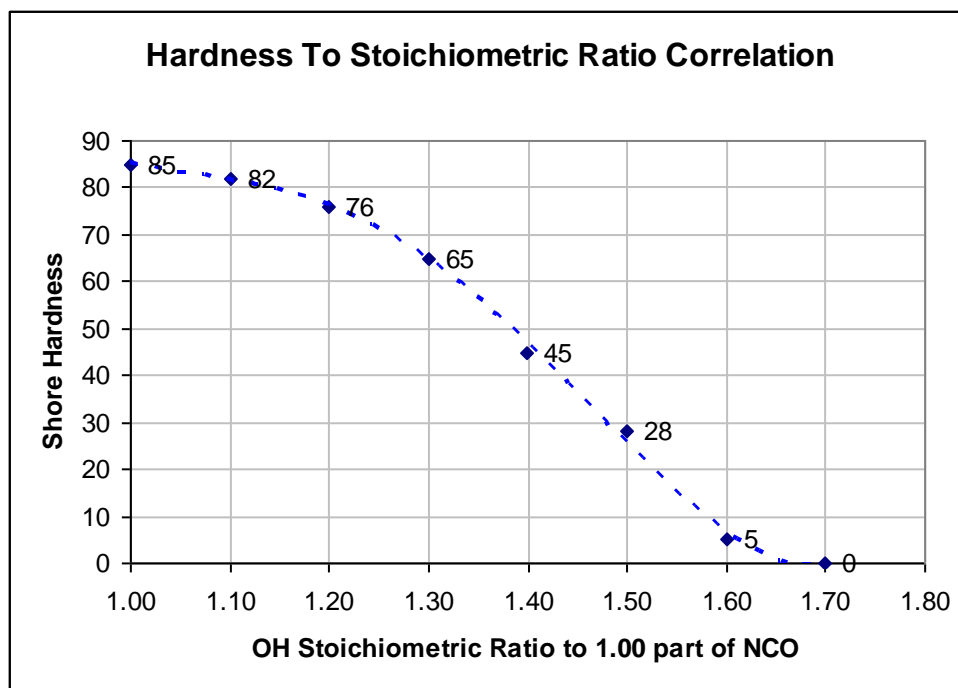




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This polyurethane gel material is formulated in such a way that the user can control/choose the hardness/deflection properties of the product. Following is reference for the hardness to the corresponding mixing ratio.

Stoichiometric Ratio NCO: OH	Weight Ratio Part-A: Part-B	Hardness Shore OO Scale
1.000: 1.000	1.000: 2.050	85
1.000: 1.100	1.000: 2.255	82
1.000: 1.200	1.000: 2.460	76
1.000: 1.300	1.000: 2.665	65
1.000: 1.400	1.000: 2.870	45
1.000: 1.500	1.000: 3.075	28
1.000: 1.600	1.000: 3.280	5
1.000: 1.700	1.000: 3.485	Liquid-like



Note: The above data is based on our lab tests, and it is reference only. The user must test the mixing ratio and yielding hardness for each application. The product hardness can be controlled more accurately by the stoichiometric ratios. However, in practice, you may use weight ratio or volume ratio for the parameter value to determine the target hardness unless you have a very narrow tolerance range for hardness. You may need to adjust your mixing ratio according to the actual hardness produced from different lots of components in order to obtain more accurately consistent results.



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Processing Conditions

Processing Temperature:

Part-A:	Room Temperature
Part-B:	Room Temperature
Mold:	Room Temperature

Curing Pattern

Pot life:	15 – 20 minutes at ambient temperature
Demolding:	3 - 6 hours at ambient temperature
Complete Cure:	3 - 5 days at ambient temperature

Note: This curing data is the processing parameters of 1:2.25 mixing ratio at room temperature. The curing rate may vary depending on the mixing ratio chosen for the process. The curing pattern can be modified by addition of a catalyst. Please consult Northstar Polymers for the modification.

Recommendations

Mixing ratio setting for your dispensing equipment is critical to the hardness determination. We recommend the mixing ratio is calibrated by dispensing the two components from the line to two cups, and use weight ratio to check for accurate metering.

This material is often encapsulated in coated cloth materials, polyurethane films, or other resilient materials. The surface of gel product is very sticky, and the gel can be cut or torn easily in many applications. The encapsulation is essential for protection of the gel in some applications. Please contact us for more information on encapsulation method. For temporary handling, you may use talc powder to prevent it from sticking to the handlers or equipment.

Use of elevated temperature during the pouring process may cause shrinkage of this material. Shrinkage will be a critical issue if you are pouring this material directly on a flexible film. The shrinkage could cause significant wrinkling of the film or warping. If excessive wrinkle occurs, the processing temperature may need to be lowered and processing rate to be slowed.

Filler Study (New)

Polyurethane casting resins in the Shore OO Durometer hardness range often allows the users to change hardness by changing the mixing ratio between the given part-A/part-B components. Typically, harder products have higher rebound property, which works negatively in vibration and impact mitigation applications.

We have conducted a test by using limestone powder filler into this formulation. At mixing ratio 100: 320 = part-A: part-B by weight, it yields a product at hardness about Shore Durometer OO 10 to 20. The rebound value* of this product is about 5%. If you crease the hardness by adjusting the ratio to 100: 258 by weight, you yield a Shore Durometer OO 70 hardness product. The rebound value of this product is increased to about 25%. At OO 80 hardness made by the similar method, the rebound value goes up to 30%.





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We made a test sample by adding limestone powder filler. When we add 19.4% loading ratio (by weight) of limestone to the ratio to make OO 70 hardness (100: 258), the hardness of the outcome increases to OO 80. However, the rebound value decreases down to 19%. The rebound property at OO 80 hardness is reduced from 30% to 19%. Addition of limestone powder helped increasing hardness without increasing rebound property.

Northstar Polymers does not compound with powder fillers, but it is relatively easy to mix powder fillers into the liquid components of MCP-V40A at a manufacturing facility before making a production batch. Using powder fillers with MCP-V40A may improve the performance of impact/vibration mitigation pads if you need the pad to be in high Shore OO hardness range.

Component Data:

Part-A

Product Code:	MPC-023
Description:	Isocyanate terminated prepolymer extended with polyether polyol
%NCO:	18.6 % +, - 0.5%
Equivalent Weight	226
Specific Gravity:	1.142
Physical State at 25 °C (77 °F):	Liquid (dark yellow color)
Viscosity at 25 °C (77 °F):	500 – 1200 cps
Storage:	Store in an airtight container in a dry indoor storage area at room temperature. The material is highly sensitive to moisture. After using the content, immediately inject dry nitrogen gas or -40° dew-point dry air into the container to purge and blanket the top space before storing. Storage temperature above 110 °F or below 65 °F will accelerate the undesirable subsequent reaction within the material and shorten the shelf life.

Part-B

Product Code:	CPB-046
Description:	Curing agent based on a blend of polyether polyols and additives
Equivalent Weight:	463
Specific Gravity:	0.976
Physical State at 25 °C (77 °F):	Liquid (clear with yellow tint)
Viscosity at 25 °C (77 °F)	300 – 900 cps
Storage:	Store in an airtight container in a dry indoor storage area at room temperature. The material is hygroscopic, and absorption of excess moisture can cause issues when processed. For long-term storage, inject dry nitrogen gas or -40° dew-point dry air into the container to blanket the material.





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Handling Information:

Storage:

Part-A (Isocyanate Prepolymer) Component

Part-A component (prepolymer) contains isocyanate component, which is highly sensitive to moisture. If it is left in air, part-A will react with atmospheric moisture and will be ruined. This reaction is non-reversible. Soon after opening the container to dispense the content, dry nitrogen gas or argon gas needs to be injected to the container to purge and blanket the top space. Please consult Northstar Polymers for nitrogen gas set-up information.

For gravity feeding system from a 55-gallon, silica gel or calcium chloride desiccant filter(s) should be installed to the vent-hole of the drum. A valve to inject dry nitrogen gas can be installed instead.

During transportation in colder season, there is a chance of freezing. The frozen material must be immediately thawed to avoid permanent damage from freezing. If the material color is opaque with the consistency of thick liquid, gel, waxy, or solid, the material requires immediate thawing. The container should be put into an industrial oven at 180 °F until the material temperature is 140 °F or the color of the material is clear with smooth liquid consistency. Storing frozen material for more than a few days will cause a permanent damage to the material, and it will not be returnable or refundable.

Store the material in a dry indoor storage within the temperature range between 72 and 96 °F. The ideal storage temperature is 90 °F. Avoid direct sunlight.

If a large amount of water mixes with a large amount of isocyanate base materials, the chemical reaction may produce a large amount of CO₂ gas and heat to create a hazardous condition. Keep the storage area free of water.

Under a certain combination of heat, catalyst (basic chemicals), amounts of reactive materials, and some other favorable conditions for the reaction, the water (or alcohol/glycol/amine) to isocyanate reaction can reach a dangerous state of accelerated reaction. The accelerated reaction may create a very high temperature condition. The thermal decomposition of isocyanate based material by extremely high temperature or fire can produce toxic gasses and smokes. Please be sure that the containers are stored in dry indoor storage, away from source of large amount of water.

If a leak is found in a drum, please place the drum in such a position that the leaking part is at the highest part of drum so that the content no longer leaks out. Cover the leaking area with dry towel to prevent air from entering. If possible, transfer the material into new container(s) with nitrogen purge. If moisture enters into an isocyanate container from a small leakage, CO₂ gas may be produced to gradually pressurize the container. If pressure built up is suspected, open the bung (or cap) very slowly to release the pressure before you change the drum position.

Part-B (Curative) Component

Part-B component is hygroscopic. If the material is exposed to ambient air, it absorbs moisture. Part-B component contaminated by moisture can become a source excessive bubbles in the product after mixed with part-A. Avoid exposure of the material to moisture in air.





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Purging the empty space in the container with dry nitrogen gas, argon gas, or negative-40-degree-due-point dry air is also recommended to prevent moisture contamination of part-B as well. (However, simply keeping the material in an airtight container may also be sufficient depending on the moisture level of the work place.)

Store it in a dry indoor storage at a room temperature between 72 and 90 °F. Avoid direct sunlight.

Note: Moisture contamination of part-B material can be reversed by heating material to 180 °F and vacuuming it at about 29" Hg or above negative pressure for 20 to 40 minutes.

Part-B material contains chemical constituents that can separate during the storage. Agitation of the part-B content before dispensing may be required for the system. Separation can be seen in a higher degree when the material is stored in cold temperature. You may need to heat to re-blend the separated material in some cases. Please consult Northstar Polymers when separation is suspected.

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 handle these materials need to read the Safety Data Sheet (SDS) for detail information on safety and handling of the material. The SDS for each component is sent with the shipment of the material.

When 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, and if you expect the isocyanate content level in the work place atmosphere may become above the threshold regulated by OSHA or by other appropriate working place safety standard, we recommend, in addition to the above, installation of a proper hooded dynamic ventilation system and/or using an appropriate type of respirator (such as a full-face respirator equipped with OSHA approved HEPA filters for particulate and organic vapor) 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 and follow the other procedures of the Standard Industrial Hygiene Practices. Please refer to the SDS for each component for the detailed health information.

For any questions, please contact Northstar Polymers.

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