Moisture-Cure Particle Bonding Agent with Variable Flexibility

(For Recycled Foam Bonding and Other Particle Bonding Applications)

MPA-221/MNB-013

Technical Data Sheet

This two-part moisture-cure polyurethane adhesive system is designed to be used with recycled ground rubber, polymer foam, polymer beads, as well as other particles such as cork granules, wood and pulp fiber/particles/powder to make various recycled foam and other bonded particle products.

By changing the blending ratio, the user can vary the flexibility of the end product. A higher amount of MPA-221 will produce a more flexible product. A higher amount of MNB-013 will produce a more rigid product.

For example, "MPA-221: MNB-013 = 95: 5" ratio can be used to make flexible floor covering mats for exercising/playing room using recycled/ground EPDM particles. With the same EPDM particles, "MPA-221: MNB-013 = 20: 80" ratio can produce semi-rigid products such as soft foam stools/tables and custom positioning/supporting parts for wheel chairs. The users can try different blending ratios to find the optimum blend for their applications. This formulation system can be used in a wide range of crumb/particle bonding applications.

The material cures with moisture. There is no solvent in this system. Curing rate can be controlled by addition of catalyst. Heat may also be used to accelerate curing.

Designations

MPA-221 (MDI Based Prepolymer to Produce Softer Film)
MNB-013 (Polymeric MDI to Produce Harder Film)

Ratio Recommendations

The ratios below are references for starting point blending ratios, and are

MPA-221: MNB-013

respectively by weight. The blending ratios can be varied for the optimum result for the intended application. The user can test to find the optimum ratio.

95: 5 for Soft Flexible Film

70: 30 for Firmer Flexible Film
20: 80 for Semi-Rigid Film
0: 100 for Rigid Film

Processing Recommendations

Blend MPA-221 and MNB-013 at the desired ratio using a mechanical mixing tool. If a larger batch is made, powered mixing tools can be used.

If blending is difficult due to the high viscosity of MPA-221, heat MPA-221 to the 100 – 160 ˚F range to reduce the viscosity. If heat is used, be sure to circulate and ventilate the working area with fans and/or other dynamic air moving apparatus.

If the blend needs to be stored for a long time, the blend must be stored in an air-tight container. The head space must be purged and blanked with dry nitrogen or argon gas.

In a blending vessel, load the particles such as recycled foam crumbs first, and pour the bonding agent blend gradually as the contents are agitated with a powered mixer.

After the particles and bonding agent are blended well, the mixture can be poured into a mold and mechanically compressed until the bonding agent cures to solid/dry consistency.

Curing Pattern

The curing time varies depending on the air moisture content, temperature, catalyst level, and other factors. Higher temperature and catalyst (amine/base catalyst) will increase the curing rate.

This product is not tested for bonding applications at uncontrolled conditions such as outdoor made-in-place applications. However, it is likely that outdoor application is possible with addition of catalyst at the installation site.

Bonding Agent Concentration

The loading ratio of bonding agent to the particle media needs to be tested for the required strength for the application. We recommend 20% to 40% bonding agent ratio by weight as the starting point for your tests. You may reduce/increase the bonding agent ratio according to your tests. Compressing the part in mold will improve the bonding capacity, and you may use a smaller amount of bonding agent.

Component Material Properties (Typical/Theoretical Values)

MPA-221 (Soft/Flexible Component)

General Description: Isocyanate Terminated Prepolymer based on MDI and polyether polyol
NCO: 1.9%
Equivalent Weight: 2206
Specific Gravity (at 77 ˚F): 1.043 grams/cm3
Viscosity: 10,000 cps at 100 ˚F, > 40,000 cps at 72 ˚F

Storage/Handling: Store indoor at room temperature between 72 ˚F and 90 ˚F. The container head space must be purged to blanket the material with dry nitrogen gas or argon gas.

MNB-013 (Hard/Rigid Component)

General Description: Polymeric MDI
NCO: 31.5%
Equivalent Weight: 133
Specific Gravity (at 77 ˚F): 1.235 grams/cm3
Viscosity: 200 cps at 77 ˚F

Storage/Handling: Store indoor at room temperature between 72 ˚F and 90 ˚F. The container head space must be purged to blanket the material with dry nitrogen gas or argon gas.

Other Notes

When the material is reacting with moisture, CO2 gas is also created. The gas can expand the part in mold if the mold is not a closed-mold with capacity to withhold the expansion pressure. The open-molded parts molded in a heated mold also have higher shrinkage after the part is cooled due to the CO2 gas expansion and shrinkage.

After the optimum blending ratio is found for the intended application, Northstar Polymers may be able to custom blend MPA-221 and MNB-013 for large consumption demands. Please consult Northstar Polymers for the details.

The film thickness of this bonding material is limited up to about 1/16” to 3/32” (3 to 5 millimeters). If a thicker film thickness is required, different formulations will be recommended.

These materials are industrial grade isocyanate based materials, which need to be handled carefully according to the safety/handling/storage recommendations. When you are handling these materials, please operate in a large area with good air circulation or well-ventilated area. The operator must wear rubber gloves, long sleeves, and protective eyewear to avoid skin/eye contact of these materials until it is cured to the solid state. Please refer to the "Handling Information" section in this document and the Safety Data Sheet for each material for the details.

Northstar Polymers does not guarantee the fitness of its products to any application. The producers/marketers of the end products are responsible for testing the functionality, safety, regulatory conformance, marketability, and all other relevant aspects to confirm the fitness of their raw materials, including these materials from Northstar Polymers, used in their end products.

Standard Packages:

5-gallon pails (40 pounds per pail)
55-gallon drums (450 pounds per drum for MPA-221, 500 pounds per drum for MNB-013)

Handling Information

Storage/Handling Information for the Component Materials

Storage:

These component materials contain isocyanate components, which are highly sensitive to moisture. If it is left in air, the material 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 head 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.

Store the containers a dry indoor storage within the temperature range between 72 and 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.

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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