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Technical Data Sheet

GK-7 has been replaced with the new formula GK-7R4. Please access the Data Sheet for GK-7R4 for the details.

https://northstarpolymers.com/051719_PDF_Files/GEL/GK-7R4_TDS_012622.pdf

GK-7

Polyurethane Gel Casting System for "Sticky Sheets/Pads" Applications

GK-7 is specifically formulated for manufacturing "sticky sheets" or "sticky pads" with the 2-part resin casting process. The material can be processed at room temperature, and can be manually processed to make smaller production quantities.

The low viscosity raw material components allow processors to cast the resin into thin layer to make "pressure sensitive adhesive" (PSA) products.

The cured material is intrinsically sticky without use of tackifier resin. Film made of GK-7 retains sticky surface indefinitely. When the surface is contaminated with dust and oil, it can easily be washed with soap and water to regain the stickiness. The cured film is soft and flexible but fairly strong to resist cut and tear.

Unlike other PSA tape products, GK-7 can be made to have a sticky surface that does not leave residue on substrate surface. The stickiness can be adjusted by simply adjusting the mixing ratio between the given part-A/part-B components so that the processors can fine-tune the stickiness of their products without formula modification.

Possible applications for GK-7 include cell-phone holders for dash boards, multipurpose sticky pads, lint remover film, sticky guitar pick holder and muting pads for other instruments, temporary adhesives for apparels and other consumer products, and many other custom applications.

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Please also refer to "FAQ for Making "Sticky Pads" or Polyurethane Based PSA Products" in later pages in this document for more information.

Designations

System Name:	GK-7
Part-A:	MPG-023
Part-B:	PNC-153
Mixing ratio:	A:B = 1: 10.2 by volume
	A:B= 1: 9.26 by weight

This formulation is made in such a way that a user can change the stickiness of the material by adjusting the mixing ratio. The stickiness changes from various processing parameters such as temperature, thickness, and substrate material. We suggest starting at 100: 926 = part-A: part-B ratio using your set up, and then adjust the ratio if the stickiness is not within your acceptable range. A higher part-B ratio makes a stickier product, and a lower part-B ratio makes a less sticky product. You can test it in the increments of 2 to 3% by weight of part-B to see the changes. The part-B ration variation should be within 10% from the starting point ratio.

Processing Temperature:

Part-A:	Ambient
Part-B:	Ambient
Mold:	Ambient

Pot-life:	8 - 10 minutes
Demolding Time:	4 - 6 hours
Complete Cure:	3 – 4 days at room temperature

(The curing pattern can be modification by use of heat and catalyst variation.)

Typical Properties of Components

Part-A Component

Product Code:	MPG-023
Description:	Isocyanate terminated prepolymer extended with polyester polyol
%NCO:	18.6% (+/- 0.5)
Amine Equivalent	225.9
Specific Gravity:	1.112
Physical State at 25 °C (77 °F):	Liquid
Viscosity at 25 °C (77 °F):	900 cps (+/- 300)

(The above data are typical values based on our lab tests.)

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The part-A material (MPG-023) is an isocyanate based material, which is highly moisture sensitive. The head space in the container must be purged and blanketed with dry nitrogen gas or argon gas after the containers are opened each time. Please refer to the enclosed SDS for the details on safety and handling the materials.

The part-A component is cold-temperature sensitive. It must be stored at warm and dry storage with temperature between 72 °F and 100 °F all time.

The part-A could freeze at temperature slightly below room temperature. The material may freeze during the transportation in winter. If the material has sign of freeze, it must be thawed immediately or it may be ruined. Heat the material to 140 – 160 °F or until it is homogeneously clear and smooth liquid. Then the component material should be stored at room temperature 70 – 100 °F. Please consult Northstar Polymers for the detailed thawing instructions.

Part-B Component

Product Code:	PNC-153
Description:	Curing agent based on a blend of polyols and additives
OH number:	37
Equivalent Weight:	1560
Specific Gravity:	1.024
Physical State at 25 °C (77 °F):	Liquid with slight haze
Viscosity at 25 °C (77 °F):	800 cps (+/- 300)

(The above data are typical values based on our lab tests.)

Part-B Storage: Store in a dry indoor storage at room temperature. The material is hygroscopic. For long-term storage, inject dry nitrogen gas or -40° due-point dry air into the container to blanket the material. Store it in an indoor storage with the temperature between 72 °F and 86 °F.

Typical Physical Properties of Cured Sheet

GK-7 is a variable ratio formulation. By changing the mixing ratio between the given part-A and part-B components, the user can change the adhesion strength. The physical properties of the resulted product also change. The following chart shows the typical physical properties of GK-7 made at different mixing ratios.

	Mix Ratio (Part-A: Part-B by weight)	Adhesion Strength to PET (LBS of force)	Hardness (Shore OO Durometer	Tensile Strength (psi)	Elongation
GK-7#1	1:8.771	2.5	45-50	57.3	>1000%
GK-7#2	1:9.254	2.9	40-45	36.2	>1000%
GK-7#3	1:9.717	3.9	25-30	10.8	>1000%

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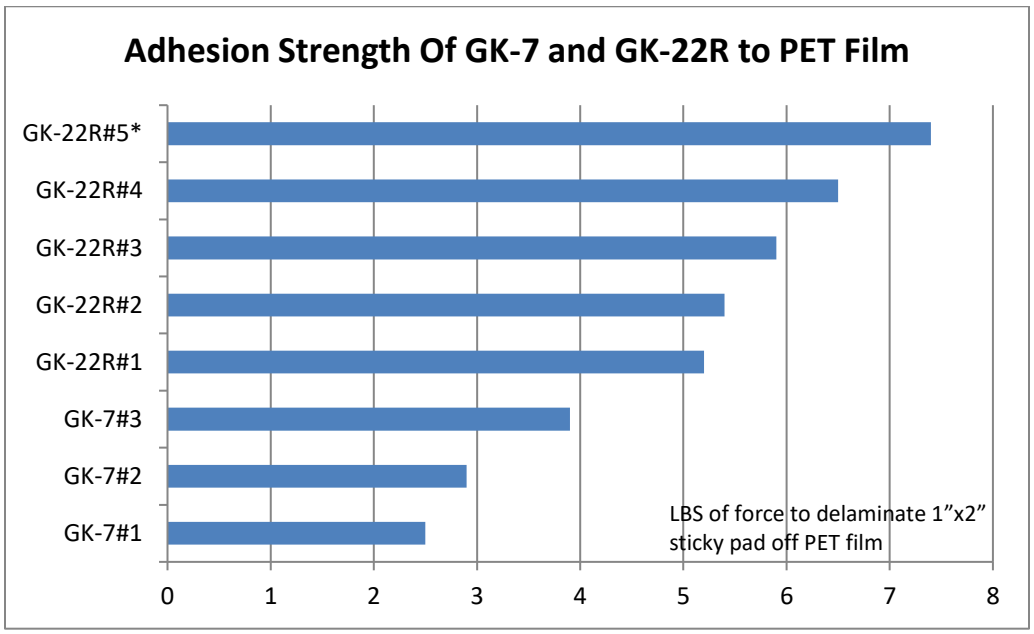
The adhesion property of the material is also affected by the processing conditions. The above data is based on our lab tests and reference only. The Adhesion Strength is measured with our in-house method. The data values are expressed in the maximum pounds of force to delaminate 1" x 2" piece of GK-7 off from PET film with an in-house 90-degree separation method. The tensile strength, as well as elongation values, are also tested in our in-house tensile/elongation test method. GK-7#2 yields the starting point stickiness, which is close to the majority of sticky pad products in the market.

For Stronger Adhesion Strength

GK-7 services the typical stickiness range of common sticky pad applications. For stronger adhesion requirements, we recommend using another one of our formulations for reusable PSA applications, GK-22R. The following chart shows the differences in adhesion strength between GK-7 and GK-22R formulations.



GK-22R yields sticky pad products with higher adhesion strength. Please refer to the Technical Data Sheet for GK-22R for more information.

Packaging Sizes:

5-gallon pails (40 LBS per pail)
55-gallon drums (450 LBS per drum)

FAQ for Making "Sticky Pads" or Polyurethane Based PSA Products

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What are the advantages of polyurethane gel sticky pads and PSA products?

GK-22R yields sticky pad products with higher adhesion strength. Please refer to the Technical Data Sheet for GK-22R for more information. Polyurethane gel is intrinsically sticky and very soft polymer. Other materials used in PSA applications are often some polymers with liquid additive called "tackifier", which create the sticky surface.
Polyurethane gel formulas we supply are 2-part casting resin materials, which can make thicker sheets and pads instead of creating thin coat of sticky layer on films or paper substrates. The surface of sticky polyurethane gel can be washable with soap and water when it is contaminated by dust/oil to recover the stickiness. The processor can control the stickiness so that he/she can make the end product with right stickiness that does not leave residue on the applied surfaces. The soft elastomeric quality of the material itself cushions and dampens impact as well as vibrations when used shock/vibration mitigation products.

What is the difference between other sticky-tape products and polyurethane gel sticky pads?

Surfaces of typical polyurethane gel elastomers are intrinsically sticky. If you slice a piece of polyurethane gel sticky pad in half, the cut surface is also sticky. The cured material is sticky not only on the surface, but inside of pad is also sticky.

Unlike other PSA products made of other types of polymers such as acrylates, vinyl, and rubber based coatings on web, polyurethane gel can be sticky without use of a liquid tackifier (plasticizer) additive. Many other PSA products (such as sticky tapes, labels, and stickers) are made with solid polymer blended with liquid tackifier to coat the surfaces of paper or plastic film. The liquid part of this sticky coating on regular sticky tape products can leach out from the polymer body of coating. This may leave some residue on applied surfaces. As the liquid additive leaves the polymer, the tack property of tape may change.

Polyurethane gel sticky pad does not have to use liquid additive to create the stickiness. This is because polyurethane gel is formulated in such a way the cured polymer itself takes a state between solid and liquid, which we call "gel" state.

In general, the coating layers of common sticky tapes are thin, and those PSA products are often not reusable after it is applied once, because this thin sticky layer can either be absorbed into the applied surface or contaminated from particles from the applied surface. Once it is contaminated, typically you cannot use water to wash off because it washes of the sticky layer together with the contaminants.

Polyurethane gel is two-part casting resin. This enables the user to make sticky pads with much thicker layer, it is unlikely to lose sticky surface to substrate. The surface is washable without losing stickiness.

Can polyurethane gel sticky pads stick to everything?

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Polyurethane gel can be made into products with a wide range of stickiness. It can be made to stick to many things. However, how a sticky pad sticks to different surfaces will be all different depending on the surface. Sticky pads (and all other PSA products such as commonly available sticky tapes) adhere to different surfaces with different adhesion strengths. The most important quality in the surfaces is the "surface energy" of the substrate.

Each material has its unique surface energy level. In general, sticky pads and other PSA products are easier to adhere to surfaces with higher surface energy. For example, glass surfaces have high surface energy. So, sticky pads will stick with higher adhesion strength.
Solid silicone polymer has very low surface energy, so the sticky pads do not adhere to solid silicone. Plastics, wall paints, and other polymer surfaces have different surface energy levels. For example, PET and polycarbonate have high surface energy, so sticky pads stick strongly. Polypropylene, polyethylene, and latex rubber have low surface energy, and sticky pads don't stick to those very well.

Polyurethane gel sticky pads can be made to stick to a wide range of different materials, but it cannot create one sticky pad with exactly the same sticking strength to different materials of different surface energy levels. When you design your product, you must limit the applicable material surfaces so you can expect the adhesion strength of your sticky pad is within the expected level. Once you have the target surfaces, you then need to adjust the stickiness by adjusting the mixing ratio between part-A and par-B components to make sticky pads to test for the adhesion strengths on those surfaces.

I want to attach the sticky pads to another part. Can I use glue on cured sticky pads to permanently adhere to other parts?

This will be difficult because cured polyurethane gel has low surface energy. It will not create a good permanent adhesion with glue. In this situation, you need to make a laminate of sticky material on high-surface-energy plastic film material.

Typically, PET films are used to make these laminates. You can simply cast a blend of metered part-A/part-B components on to the PET film and cure. This will make a permanent adhesion between the sticky layer and PET film. The open side of PET film can be used to adhere to other surfaces using commonly available glue products (such as Superglue) to create permanent adhesion. Some PET film products contain an internal release agent, which prevents layers of film from sticking to each other. If you need to use such a film, you may need to use a surface modification method to increase the surface energy of the film.

Can I use polyurethane gel sticky material for medical or personal care applications?

If you need to confirm skin contact safety or the cytotoxicity of the material for your application, you should not use polyurethane gel. We use industrial-grade raw materials, which contain a small amount of impurities. Even a very small amount of impurities, such as residual catalysts, additives, and monomers may become an issue for certain applications with strict regulatory conformances and safety concerns.

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More questions?

Please feel free to contact us at info@nnorthstarpolymers.com to ask any questions regarding the content of this document.

Storage, Handling, Safety Information

Storage:

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 will be 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 72 and 87 °F.

Part-A component freezes just below room temperature. The material may be frozen when you receive. Part-A component must be thawed immediately. If the material is left frozen for an extended period of time, a side reaction undergoes and the material will be ruined. The material temperature needs to reach 140 °F to be thawed. Please consult the instructions provided by Northstar Polymers for details.
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 materials 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 component is hygroscopic. If the material is exposed to ambient air, it may absorb moisture. Moisture contaminated part-B material may become source of degradation or excessive bubbles in the product. Avoid exposure of the material to air. Purging the empty space in the container with nitrogen gas or negative-40-degree-due-point dry air is also recommended to prevent moisture contamination of part-B as well; however most of the cases, keeping in an airtight container will be sufficient. Store it in a dry indoor storage at a room temperature between 65 and 85 °F. The moisture contamination of part-B material is reversible. By heating material to 160 - 180 °F and vacuuming it at about 29" Hg negative pressure for several hours will reduce the moisture level.

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Safety Information:

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 MSDS for each component for the detailed health information.

For any questions, please contact Northstar Polymers.

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Revision: 4/24/2020