SOLVENT SYSTEMS International, Inc.
Environmental Services

Offer Sheet

Product	Nichigo G-Polymer (Butenediol-Vinyl Alcohol copolymer) intended for industrial applications, premium, high grade. Originally sold for $11/lb.
Quantity	20 kg bags
Net weight	22,500 lbs.
Availability	One time
Location	FOB Des Moines, IA 50321
Date	8/21/25
COA & SDS	Attached below

Nichigo G-Polymer™ – Commercial Applications

High-Performance, Glycerol-Based Thermoplastic Resin

Nichigo G-Polymer™ offers a unique combination of clarity, flexibility, printability, and environmental performance, making it ideal for a wide range of commercial uses. Below are key applications across various industries:

Food Packaging Films
- Used in flexible, biodegradable films and wraps.
- Provides excellent oxygen barrier and printability.
- Suitable for packaging snacks, produce, or baked goods.

Labels & Shrink Sleeves
- Applied in shrink label films due to high clarity and gloss.
- Adheres well to containers of varying shapes.
- Ideal for beverage bottles, cosmetics, and household products.

Blister Packaging
- Employed in thermoformed blister packs.
- Offers a sustainable alternative to traditional PVC-based blisters.
- Used in pharmaceuticals, electronics, and consumer goods.

Printing & Graphics
- Suitable for printing substrates where flexibility and clarity are required.
- Compatible with various inks and printing methods (e.g., gravure, flexographic).

Medical & Hygiene Applications
- Utilized in disposable medical products like pouches or device packaging.
- Meets hygiene standards and offers non-toxic performance.

Sustainable Plastics Blending
- Blended with other polymers to enhance biodegradability and reduce carbon footprint.
- Supports circular economy initiatives in packaging and film industries.

Agricultural Films
- Used in mulch films or protective coverings.
- Biodegradable nature helps reduce plastic waste in agriculture.

Brian Svrusis
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Solvent-Systems.com

MITSUBISHI CHEMICAL CORPORATION

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PHONE:81-3-6748-7804
FAX :81-3-3286-1246

25 October, 2021
NO.00163949

To whom it may concern:
We hereby certify that the statements undermentioned are true and correct in all respects.

Certificate of Analysis

Commodity : NICHIGO G-POLYMER AZF8035Q

Purchase Order : MCSRS-A72705 PO-A72705

Lot NO. : 15935

Quantity : 300KG

Analysis :

			SPECIFICATION
VOLATILE	(wt%)	1.4	MAX.5.0
HYDROLYSIS	(mol%)	98.7	MIN.98.0
VISCOSITY	(mPa・s)	2.9	2.8 ～ 3.3
MELTING POINT	(℃)	174	166 ～ 178

SAFETY DATA SHEET

1. Identification

Product identifier	**Nichigo G-Polymer™ AZF8035Q**
Other means of identification	
Synonyms	Chemical name; Butenediol-Vinyl Alcohol copolymer
Recommended use	Binder. Adhesive. Dispersing agent. Coating.
Recommended restrictions	None known.
Manufacturer/Importer/Supplier/Distributor information	
Company Name	Mitsubishi Chemical Corporation
Address	1-1, Marunouchi 1-Chome, Chiyoda-ku, Tokyo 100-8251, Japan
Division	Gohsenol Department
Telephone	+81-3-6748-7804
Fax	+81-3-3286-1246
E-mail	
Emergency phone number	+01-760-476-3962
Access Code	334989
Information on operation hours	24/7/365

2. Hazard(s) identification

Physical hazards	Not classified.	
Health hazards	Specific target organ toxicity, single exposure	Category 1 (central nervous system, systemic toxicity, visual organs)
Environmental hazards	Not classified.	
OSHA defined hazards	Combustible dust	

Label elements

Signal word	Danger
Hazard statement	May form combustible dust concentrations in air. Causes damage to organs (central nervous system, systemic toxicity, visual organs).
Precautionary statement	
Prevention	Prevent dust accumulation to minimize explosion hazard. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Do not breathe dust/fume/gas/mist/vapors/spray. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Observe good industrial hygiene practices.
Response	If exposed: Call a poison center/doctor. Take off contaminated clothing and wash it before reuse. In case of fire: Use appropriate media to extinguish.
Storage	Store locked up.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	None known.
Supplemental information	None.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
Butenediol-Vinyl Alcohol copolymer		Non-disclosure	>= 93.5
METHANOL		67-56-1	< 3.0
METHYL ACETATE		79-20-9	< 1.0

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact Wash off with soap and water. Get medical attention if irritation develops and persists.

Eye contact Do not rub eyes. Rinse with water. Get medical attention if irritation develops and persists.

Ingestion Call a physician or poison control center immediately. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not use mouth-to-mouth method if victim ingested the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

Most important symptoms/effects, acute and delayed Narcosis. Behavioral changes. Decrease in motor functions. Dusts may irritate the respiratory tract, skin and eyes.

Indication of immediate medical attention and special treatment needed Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.

General information If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media Avoid high pressure media which could cause the formation of a potentially explosible dust-air mixture. Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2). Apply extinguishing media carefully to avoid creating airborne dust.

Unsuitable extinguishing media Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical Explosion hazard: Avoid generating dust; fine dust dispersed in air in sufficient concentrations and in the presence of an ignition source is a potential dust explosion hazard. During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

Fire fighting equipment/instructions In case of fire and/or explosion do not breathe fumes. Move containers from fire area if you can do so without risk.

Specific methods Use standard firefighting procedures and consider the hazards of other involved materials.

General fire hazards May form combustible dust concentrations in air.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Use only non-sparking tools. Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Wear appropriate protective equipment and clothing during clean-up. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Take precautionary measures against static discharge. Use only non-sparking tools. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). This product is miscible in water. Stop the flow of material, if this is without risk.

Large Spills: Wet down with water and dike for later disposal. Shovel the material into waste container. Following product recovery, flush area with water.

Small Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

Environmental precautions Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling

Minimize dust generation and accumulation. Avoid significant deposits of material, especially on horizontal surfaces, which may become airborne and form combustible dust clouds and may contribute to secondary explosions. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Dry powders can build static electricity charges when subjected to the friction of transfer and mixing operations. Provide adequate precautions, such as electrical grounding and bonding, or inert atmospheres. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Explosion-proof general and local exhaust ventilation. Avoid prolonged exposure. When using, do not eat, drink or smoke. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Store locked up. Keep containers tightly closed in a dry, cool and well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit. At this time, the other constituents have no known exposure limits.

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
METHANOL (CAS 67-56-1)	PEL	260 mg/m3
		200 ppm
METHYL ACETATE (CAS 79-20-9)	PEL	610 mg/m3
		200 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
METHANOL (CAS 67-56-1)	STEL	250 ppm
	TWA	200 ppm
METHYL ACETATE (CAS 79-20-9)	STEL	250 ppm
	TWA	200 ppm

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
METHANOL (CAS 67-56-1)	STEL	325 mg/m3
		250 ppm
	TWA	260 mg/m3
		200 ppm
METHYL ACETATE (CAS 79-20-9)	STEL	760 mg/m3
		250 ppm
	TWA	610 mg/m3
		200 ppm

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Determinant	Specimen	Sampling Time
METHANOL (CAS 67-56-1)	15 mg/l	Methanol	Urine	*

* - For sampling details, please see the source document.

Exposure guidelines

US - California OELs: Skin designation

METHANOL (CAS 67-56-1) Can be absorbed through the skin.

US - Minnesota Haz Subs: Skin designation applies

METHANOL (CAS 67-56-1) Skin designation applies.

US - Tennessee OELs: Skin designation

METHANOL (CAS 67-56-1)	Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

METHANOL (CAS 67-56-1)	Can be absorbed through the skin.

US NIOSH Pocket Guide to Chemical Hazards: Skin designation

METHANOL (CAS 67-56-1)	Can be absorbed through the skin.

Appropriate engineering controls Explosion-proof general and local exhaust ventilation. Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields (or goggles).

Skin protection

Hand protection Wear appropriate chemical resistant gloves.

Other Wear appropriate chemical resistant clothing. Use of an impervious apron is recommended.

Respiratory protection If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn.

Thermal hazards Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Physical state Solid.

Form Powder. Granular.

Color White to light yellow.

Odor Slight. Vinegar.

Odor threshold Not available.

pH 5 - 7

Melting point/freezing point 302 - 446 °F (150 - 230 °C)

Initial boiling point and boiling range Not available.

Flash point > 158.0 °F (> 70.0 °C) Closed Cup

Evaporation rate Not available.

Flammability (solid, gas) Not available.

Upper/lower flammability or explosive limits

Flammability limit - lower (%) Not available.

Flammability limit - upper (%) Not available.

Explosive limit - lower (%) Not available.

Explosive limit - upper (%) Not available.

Vapor pressure Not available.

Vapor density Not available.

Relative density Not available.

Solubility(ies)

Solubility (water) Completely soluble

Solubility (solvents) Soluble; DMF, DMSO

Partition coefficient (n-octanol/water) < -0.57

Auto-ignition temperature Not available.

Decomposition temperature	> 446 °F (> 230 °C)
Viscosity	Not available.

Other information

Explosive properties	Not explosive.
Oxidizing properties	Not oxidizing.
Specific gravity	1.2 - 1.3

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. Avoid temperatures exceeding the decomposition temperature. Avoid temperatures exceeding the flash point. Contact with incompatible materials. Minimize dust generation and accumulation.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Prolonged inhalation may be harmful.
Skin contact	No adverse effects due to skin contact are expected.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	Expected to be a low ingestion hazard.
Symptoms related to the physical, chemical and toxicological characteristics	Narcosis. Behavioral changes. Decrease in motor functions. Dusts may irritate the respiratory tract, skin and eyes.

Information on toxicological effects

Acute toxicity

Product	Species	Test Results
Nichigo G-Polymer™ AZF8035Q		
Acute		
Oral		
LD50	Rat	> 2000 mg/kg
Components	**Species**	**Test Results**
METHYL ACETATE (CAS 79-20-9)		
Acute		
Dermal		
LD50	Rabbit	> 5000 mg/kg
Oral		
LD50	Rat	4800 mg/kg

Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.

Respiratory or skin sensitization

Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	Not classifiable as to carcinogenicity to humans.

IARC Monographs. Overall Evaluation of Carcinogenicity

Not listed.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1052)

Not regulated.

US. National Toxicology Program (NTP) Report on Carcinogens

Not listed.

Reproductive toxicity This product is not expected to cause reproductive or developmental effects.

Specific target organ toxicity - single exposure Causes damage to organs (central nervous system, systemic toxicity, visual organs).

Specific target organ toxicity - repeated exposure Not classified.

Aspiration hazard Not an aspiration hazard.

Chronic effects Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Components		Species	Test Results
METHANOL (CAS 67-56-1)			
Aquatic			
Acute			
Fish	LC50	Fish	12700 mg/l, 96 h
METHYL ACETATE (CAS 79-20-9)			
Aquatic			
Algae	EC50	Algae	> 120 mg/l, 72 hours

Persistence and degradability No data is available on the degradability of any ingredients in the mixture.

Bioaccumulative potential

Partition coefficient n-octanol / water (log Kow)

Nichigo G-Polymer™ AZF8035Q	< -0.57
METHANOL	-0.77
METHYL ACETATE	0.18

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Toxic Substances Control Act (TSCA) One or more components of the mixture are not on the TSCA 8(b) inventory or are designated “inactive”.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

METHANOL (CAS 67-56-1)	Listed.
METHYL ACETATE (CAS 79-20-9)	Listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1052)

Not regulated.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

Classified hazard categories Combustible dust
Specific target organ toxicity (single or repeated exposure)

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
METHANOL	67-56-1	< 3.0

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

METHANOL (CAS 67-56-1)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Contains component(s) regulated under the Safe Drinking Water Act.

FEMA Priority Substances Respiratory Health and Safety in the Flavor Manufacturing Workplace

METHYL ACETATE (CAS 79-20-9)	Low priority

US state regulations

California Proposition 65

WARNING: This product can expose you to METHANOL, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

California Proposition 65 - CRT: Listed date/Developmental toxin

METHANOL (CAS 67-56-1)	Listed: March 16, 2012

US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))

METHANOL (CAS 67-56-1)

16. Other information, including date of preparation or last revision

Issue date 04-15-2019

Version # 01

Further information Refer to NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids, for safe handling.

Disclaimer This safety data sheet (SDS) is issued based on the latest reference, data etc currently available. The information in this SDS has been carefully assessed, but no guarantee is given for its accuracy. We cannot anticipate all conditions under which this product may be used. It is the user’s responsibility to take appropriate safety measures for handling.

Revision information

Product and Company Identification: Synonyms
Composition / Information on Ingredients: Ingredients
Physical & Chemical Properties: Multiple Properties
HazReg Data: Pacific Rim
GHS: Classification

Nichigo G-Polymer™

Issued Date: July 23, 2019

Nichigo G-Polymer™

Gas Barrier Solution Coating

Mitsubishi Chemical Corporation

Advanced Polymer Business Domain
Sustainable Resources Division
Gohsenol Department

MITSUBISHI CHEMICAL

KAITEKI Value for Tomorrow
Mitsubishi Chemical Holdings Group

Features

Nichigo G-Polymer™ is a biodegradable and excellent gas barrier material.
The stabilities of Nichigo G-Polymer™ water solution are excellent.

Grades

<Specification>

Grade	OKS-8118	AZF8035Q	BVE8049Q	OKS-1009
Viscosity(20ºC 4% solution)	2.8-3.3mPas	2.8-3.3mPas	4.0-5.0mPas	13.5-16.5mPas

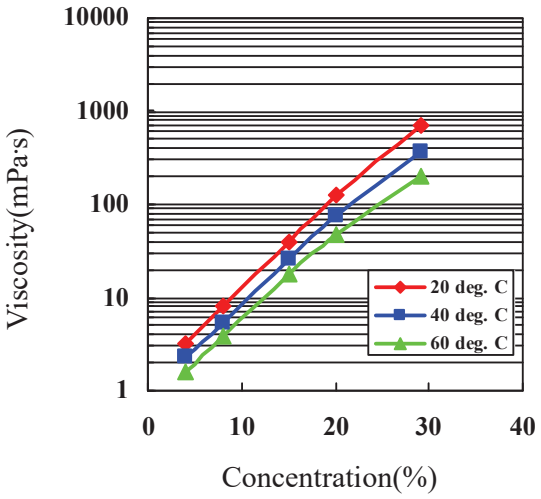
<Feature of Each Grades>

Grade	OKS-8118	AZF8035Q	BVE8049Q	OKS-1009
Feature	Low Viscosity Type Higher Barrier at High Humidity	Low Viscosity Type	Standard Grade	High Viscosity Type
Shape	Powder	Powder	Powder	Powder

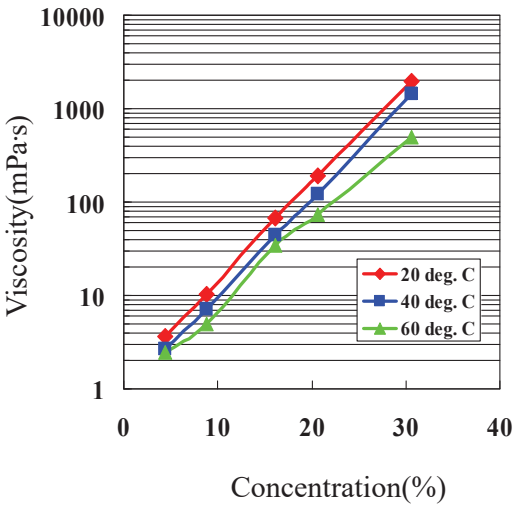
Nichigo G-Polymer™

Viscosity of G-Polymer water solution

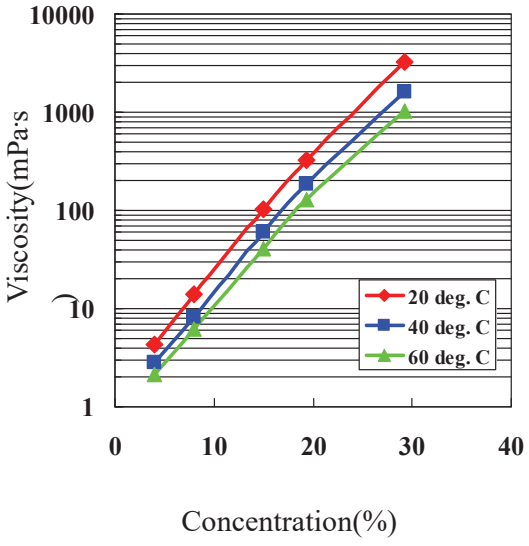
AZF8035Q



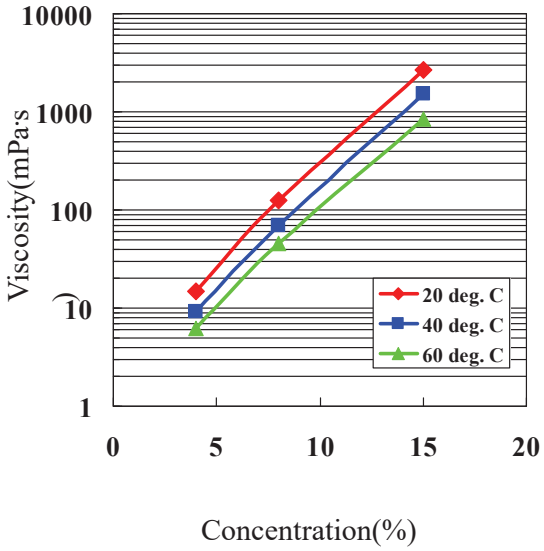
OKS-8118



BVE8049Q



OKS-1009



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Nichigo G-Polymer™

Barrier property of G-Polymer Solution coated film

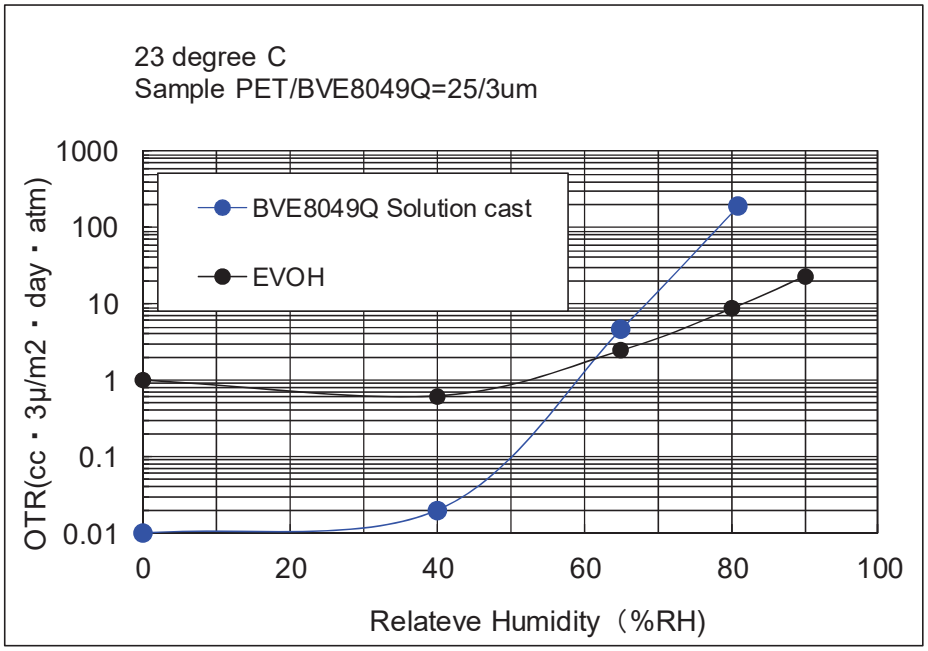
Nichigo G-Polymer has the highest oxygen gas barrier property under 60%RH among any thermo plastics.

	OTR(cc/m2 day atm)	
	23°C Dry	23°C 40%RH
G-Polymer (3um) coated PET	0.01	0.02
EVOH (3um) coated PET	1.0	0.6
PET film (25um)	40	40

Nichigo G-Polymer : BVE8049Q

EVOH : Ethylene content = 32mol%

<Humidity dependence of OTR of G-Polymer>



EX Recommendable coating condition

Solvent : Water or Water and Ethanol (max.30wt%) mixture

Solution Concentration : 5-15%

（Depend on coating machine, target coating thickness, line speed etc.）

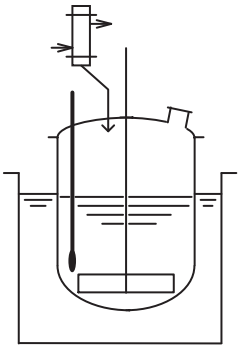
Drying temperature : 70-120 degree C

<Recommendation>

- ♦ Use of anchor coat agent for wettability and adhesion
- ♦ Use of corona treated base film for adhesion

Example for dissolution method of G-Polymer

G-Polymer is charged in vessel with condenser into room temperature water under agitation. After finishing the charge, begin to raise the temperature to 80-90 degree C. Keep at this temperature for 30-60 minutes under continued agitation until it has completely dissolved.



Nichigo G-Polymer™

Example for improvement method of G-Polymer gas barrier property under high humidity

G-Polymer shows high gas barrier property at low humidity, but G-Polymer is a hydrophilic and water soluble material, so its gas barrier properties are influenced by humidity. In fact G-Polymer's OTR increase drastically over 60%.

Assumed the method of improvement of gas barrier property at high humidity as follow,

- High drying condition or heat treatment (100～120C)
- OKS-8118 has higher gas barrier property at high humidity
- Hybrid with clay

＜High drying condition and OKS-8118＞

Grades	OTR (cc 3um/m2 day atm)　23C 80%RH	
	80C x 10min	120C x 10min
OKS-8118	30	30
AZF8035Q	140	110

High drying condition makes the gas barrier property improved.

＜Hybrid with clay＞

Grades	OTR (cc 3um/m2 day atm) 23C 80%RH
OKS-8118	30
OKS-8118 + Clay 7.5%	3.5

Clay : Kunipia F (Kunimine Kougyou)
Drying condition : 120C 10min

Addition of clay into G-Polymer makes the gas barrier property at high humidity improved.

Method of making Hybrid of G-Polymer and clay

Clay is charged in vessel into room temperature ion-exchanged water under agitation. After finishing the charge, the dispersion is stirred for 30 minutes. After that, G-Polymer is charged into the dispersion and the temperature is raised to about 80 degree C. Keep at this temperature for 30-60 minutes under continued agitation until it has completely dissolved.

Recommendable anchor coat agent for G-Polymer solution coating

Trade name	Titabond T-100	Dicdry AC-108
Manufacture	Nippon Soda	DIC Graphics
Base resin	Polyethylene imine	Polyethylene imine
Concentration	11wt%	8wt%
Solvent	Water	Methanol
Recommendable dilution	1/29	1/29
Dilution solvent	Water/EtOH 20/96wt	Water/Alcohol 10/19wt

From AC agent manufacture

Adhesive Strength

Film structure	Peel point	Adhesive Strength (N/15mm)
Corona treated O-PET/Titabond T-100/BVE8049Q	Ac/PET	0.86
Non-corona treated O-PET/Titabond T-100/BVE8049Q	Ac/PET	0.07
Corona treated O-PP/Titabond T-100/BVE8049Q	Ac/PP	0.94

Recommendation of wetting agent

The usage of wetting agent is recommendable for improvement on the wettability of G-Polymer water solution on anchor coating agent layer.

Wetting agent : Olfine EXP-4123 (produced by Nisshin Chemical)
Additive amount : 0.05-0.1wt% (against solution)

By addition of wetting agent, G-Polymer solution can be coated on hydrophobic anchor coat agent layer.

Recommendable anchor coat agent for G-Polymer solution with wetting agent

Trade name	EL-530A 530B
Manufacture	Toyo Morton
Base resin	Polyester urethane/Polyester
Concentration	50wt%
Solvent	Ethyl acetate
Recommendable dilution (AC-A/AC-B/solvent)	100/100/600-1400
Dilution solvent	Ethyl acetate MEK, Toluene

Wettability and Adhesion

Film structure	Wettability	Adhesion (Tape test)
Corona treated O-PET/EL530/BVE8049Q	Shed	-
Corona treated O-PET/EL530/BVE8049Q+EXP-4123	Good	Good

Gas barrier property of G-Polymer solution with wetting agent

	OTR(cc 3um/m2 day atm)	
Sample	23°C 50%RH	23°C 80%RH
BVE8049Q(5wt% solution)	0.4	100
BVE8049Q+EXP-4123(0.1%)	0.4	100

G-Polymer solution was coated on PET film.

The influence of wetting agent against G-Polymer barrier property was not observed.

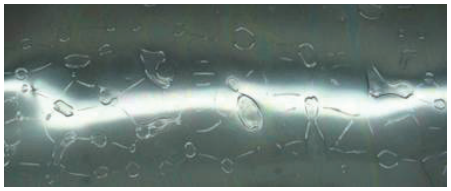
Optional Recommendation

By addition of Polyethylene imine to G-Polymer solution, G-Polymer layer after drying can be adhered to corona treated substrate. But the blended solution is unstable.
The additive that Nippon Gohsei found and recommends can improve the stability of the blended solution.

G-Polymer/Polyethylene imine = 80/20 (wt solid base) 5% water solution

	Additive	
	0%	**0.1%**
Appearance	Inhomogeneous	**Homogeneous**
Adhesion (Tape test)	Good	**Good**

The solution was coated on corona treated O-PET film and dried at 100 degree C for 10 min..



Inhomogeneous appearance

Homogeneous appearance

Gas barrier property of the blended solution of G-Polymer and AC agent

Sample	OTR (cc 3um/m2 day atm)		
	23°C Dry	23°C 50%RH	23°C 65%RH
BVE8049Q +Polyetylene imine +Additive	0.6	0.9	14

Regarding the additive, please contact Nippon Gohsei.

Nichigo G-Polymer™

Example of coating condition

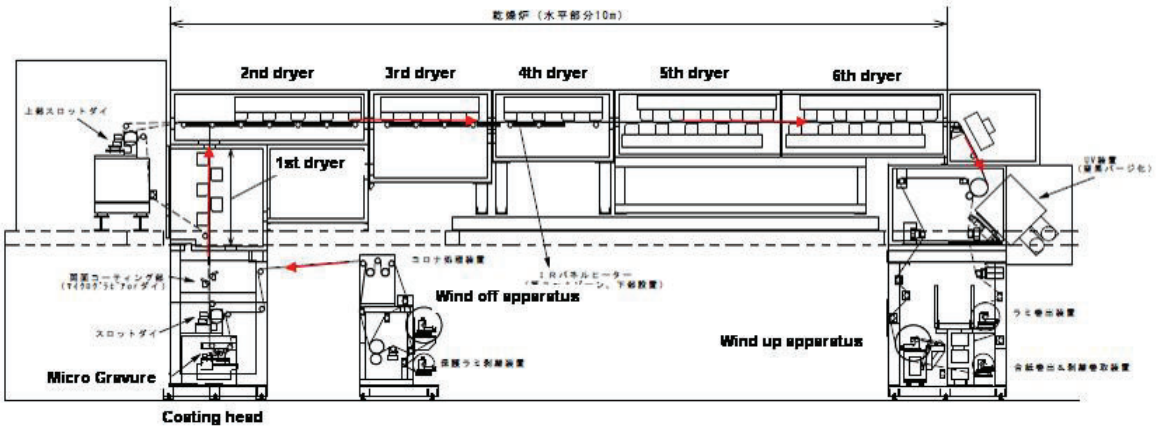
Machine

Coating facility: CAG-750 (Labo co.,Ltd coating Research Center)

Coating Head: Micro Gravure™ (Yasuiseiki) (50mmφ)
Reverse kiss coater

Coating width (Max): 750mm

Dryer: 6 zones
12m



Substrate

O-PET film

Thickness: 38um

Corona treatment: 40w min./m^2

Ancor coat

Polyetylene imine type : Titabond T-100 (Nippon Soda)

Solvent: Alcohol/Water=80/20

Concentration: 0.4wt%

Coating condition of Ancor coat

Target thickness (Dry): 0.1 um
Solution temperature: 20 degree C
Micro Gravure: Tri-helic type
200Lines / Inch
Coating width: 700mm
Line speed: 50m/min
Dry temperature: 80 degree C
Drying time: 14 sec
Air flowing: 9m/sec

G-Polymer Solution

G-Polymer: BVE8049Q
Solvent: Water
Concentration: 10wt%
Viscosity: 60cps

G-Polymer: AZF8035Q
Solvent: Water
Concentration: 10wt%
Viscosity: 15cps

Coating condition of G-Polymer solution

BVE8049Q
Target thickness (Dry): 0.5 um
Solution temperature: 20 degree C
Micro Gravure: Tri-helic type
200Lines / Inch
Coating width: 700mm
Line speed: 50m/min
Dry temperature: 100 degree C
Drying time: 14sec
Air flowing: 9m/sec

AZF8035Q

Target thickness (Dry):	0.5 um
Solution temperature:	20 degree C
Micro Gravure:	Tri-helic type
	150Lines / Inch
Coating width:	700mm
Line speed:	50m/min
Dry temperature:	100 degree C
Drying time:	14sec
Air flowing:	9m/sec