

CYTEC[®]

IBMA Monomer N-(iso-butoxymethyl)Acrylamide



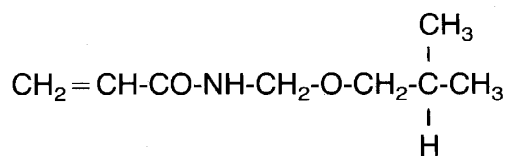
CYTEC

CYLINK[®] IBMA Monomer

N-(iso-butoxymethyl)Acrylamide

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CAS No. 16669-59-3

Introduction

N-(iso-butoxymethyl) acrylamide (IBMA), a homolog of N-methylolacrylamide (NMA), is the isobutyl ether of NMA. It contains a readily polymerizable vinyl group as well as a crosslinkable iso-butoxymethyl group. The isobutyl group imparts organic solubility to IBMA permitting the preparation of three general classes of polymers:

1. Organic soluble or solvent based polymers which, on application can be thermoset or crosslinked through either self or external crosslinking mechanisms.
2. Water based or emulsion polymers which, can also be either self or externally crosslinked at the point of application.

The presence of the iso-butoxymethyl group offers several advantages in emulsion polymers.

- The organic solubility of IBMA enhances its compatibility with other vinyl monomers permitting the incorporation of larger quantities into the polymer backbone relative to NMA.
- The alkyl ether stabilizes the methylol group, thus providing greater resistance to premature crosslinking.
- The iso-butoxymethyl group in IBMA provides a more controllable cure rate, thus minimizing cracking and checking of the final thermoset polymers.^{1,2}

3. In radiation curing systems, IBMA can be used as a reactive diluent. All of the components present in IBMA with the exception of a small amount of isobutanol are radiation polymerizable through the

vinyl double bond. Upon further heating of the IBMA-containing radiation-cured polymer, additional crosslinking can take place through the iso-butoxymethyl group.

The major polymer properties imparted by IBMA include:

- Improved water and solvent resistance
- Improved adhesion
- Improved tensile strength
- Higher impact resistance
- Flexibility
- Resistance to blocking
- Good hand properties

¹ "Aqueous Acrylic Coating Composition for Electrical Conductors", Craig, John D., E.I. duPont de Nemours and Co., U.S. Patent 4,129,544 (December 1978).

² "Survey of the Applications, Properties and Technology of Crosslinking Emulsions", Grawe, John R. and Butkin, B. George, *Journal of Coating Technology* 50, No. 643 (August 1978) Part II, Page 69, Paragraph 4 - Anticorrosive coatings.

Typical Properties

Physical Properties

| | |
|---------------------------------------|--|
| Appearance | Clear to slightly hazy liquid yellow to pink in color. |
| Assay | |
| IBMA & DIBMA*, % | 83 minimum |
| N-Methylolacrylamide, % | 5 |
| Acrylamide, % | 5 |
| iso-Butanol, % | 5 |
| Inhibitor, MEHQ, ppm | 200 |
| Formaldehyde, max., % | 0.5 |
| Viscosity, cps, @ 25°C | 80 maximum |
| Brookfield LVT, No. 1 spindle, 60 rpm | |
| Refractive Index, n_D^{25} | 1.459-1.462 |
| Boiling point, °C | 99-100 @ 0.03mmHg ³ |
| Specific gravity, @ 25°C | 0.97 |
| Homo polymer T _g , °C | 48 |

Solubility, @ 25°C

| | |
|----------------------|-----------|
| Water | Insoluble |
| Acetone | Soluble |
| Acetonitrile | Soluble |
| Benzene | Soluble |
| Carbon tetrachloride | Soluble |
| Chloroform | Soluble |
| Dimethylformamide | Soluble |
| Ethyl acetate | Soluble |
| Hexane | Insoluble |
| Methanol | Soluble |
| Tetrahydrofuran | Soluble |
| Acrylonitrile | Soluble |
| Ethyl acrylate | Soluble |
| Methyl methacrylate | Soluble |
| Styrene | Soluble |
| Vinyl acetate | Soluble |

Stability

IBMA is stable under normal storage conditions. It does not show any significant change in viscosity or reactivity after three months storage at 48°C. However, exposure to ultraviolet light, low pH and/or unnecessary heat should be avoided. Storage in a cool dark place is recommended. Contact with metallic copper, bronze or brass during storage should be avoided.

Chemical Reactions and Properties

Reactions of the Vinyl Group

IBMA copolymerizes readily with most vinyl monomers such as acrylates, styrene, vinyl chloride, acrylonitrile, acrylamide and vinyl acetate. The following reactivity data was developed using solution polymerizations at 60°C, azobisisobutyronitrile as the initiator and benzene as a solvent.

| | M ₁ | M ₂ | r ₁ | r ₂ |
|---------------------|----------------|----------------|----------------|----------------|
| Methyl methacrylate | IBMA | | 1.11 | 1.27 |
| Ethyl acrylate | IBMA | | 0.51 | 4.98 |
| Vinyl acetate | IBMA | | 0.015 | 34.00 |

Reaction of the iso-Butoxymethyl Group

Copolymers made with IBMA can be crosslinked utilizing the reactivity of the iso-butoxymethyl group. The crosslinking reaction can occur via condensation reaction of the iso-butoxymethyl groups with hydroxyl, carboxyl, amine or amide groups that may be present in the copolymer system or in the substrates (e.g. cellulosic products) to which the IBMA-containing copolymer is applied. While heat alone can affect post cure (crosslinking), generally a combination of acid catalyst and one or more of the above mentioned groups in the polymer reduces the time and temperature of cure. Such groups will also tie up the hydroxymethyl group as part of the polymer or as part of the polymer-to-substrate linkage.

The crosslinking (cure) mechanism of the iso-butoxymethyl moiety in such polymers or in polymer-to-substrate linkages is obviously a very complex chemical reaction that can only be depicted in a general way by chemical equations. Studies by researchers in the field,^{4,5,6} however, give sufficient evidence to the chemistry involved, so that a general understanding of how crosslinking takes place is possible. Isobutanol is usually generated during the crosslinking reaction.

* DIBMA = N, N'-di(iso-butoxymethyl)acrylamide

³ Dowbenko, R., Christenson, R.M., and Salem A.N., *J. Organic Chemistry* **28**, 3458 (1963).

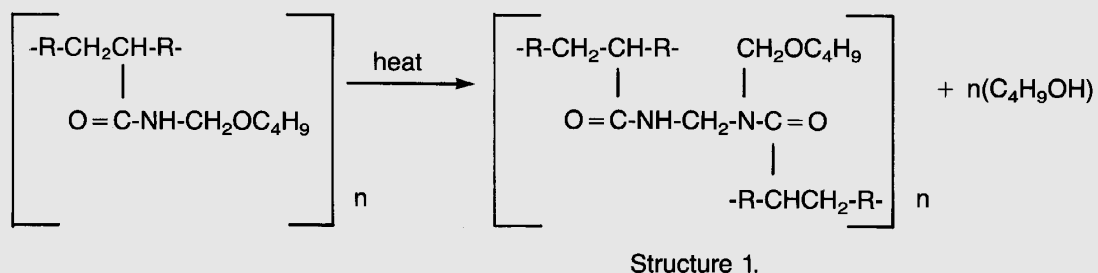
⁴ "Study of Latex Crosslinking by Thermal Evolution Techniques", Bassett, D.R., Sherwin, M.A. and Hager, S.L.; *Journal of Coatings Technology*, **51**, No. 657, 65-72 (1979).

⁵ "The Crosslinking of Dispersion Copolymers Containing N-Alkoxyethyl Groups", Snuparek, J., Jr., and Krejcar, E., *Farbe and Lack* **84**, 312-315 (1978).

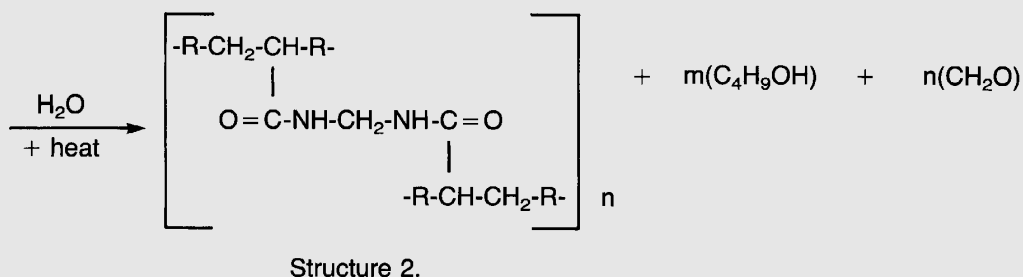
⁶ Hubner, K. and Kollinsky, F., *Angew. Makromol Chemie*, **11**, 125 (1970).

These reactions can be illustrated generally by chemical equations as follows:

Curing by Heat



R = vinyl backbone of an IBMA containing copolymer



In the first step, thermal condensation yields the alcohol as the only cleavage product, yielding Structure 1. This intermediate can be hydrolyzed in the presence of water and heat to yield Structure 2, isobutyl alcohol and formaldehyde

Studies by Bassett, Sherwin and Hager⁴, however, show no release of formaldehyde from emulsion polymers containing IBMA at temperatures up to 255°C. This temperature exceeds temperatures normally used for curing.

Infrared spectroscopic measurements made by Snuparek and Krejcar⁵ also indicate that a formaldehyde-isobutyl-diacetyl is formed as a by-product, thus tying up the formaldehyde, preventing its release in Structure 2.

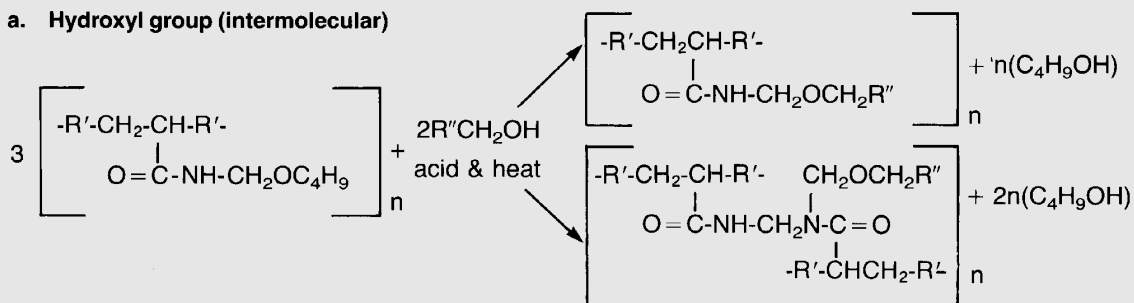
⁴ "Study of Latex Crosslinking by Thermal Evolution Techniques", Bassett, D.R., Sherwin, M.A. and Hager, S.L.; *Journal of Coatings Technology*, 51, No. 657, 65-72 (1979).

⁵ "The Crosslinking of Dispersion Copolymers Containing N-Alkoxyethyl Groups", Snuparek, J., Jr., and Krejcar, E., *Farbe and Lack* 84, 312-315 (1978).

Crosslinking with Hydroxyl Groups

The use of an acid catalyst in the presence of a hydroxyl containing compound minimizes or eliminates the release of formaldehyde.

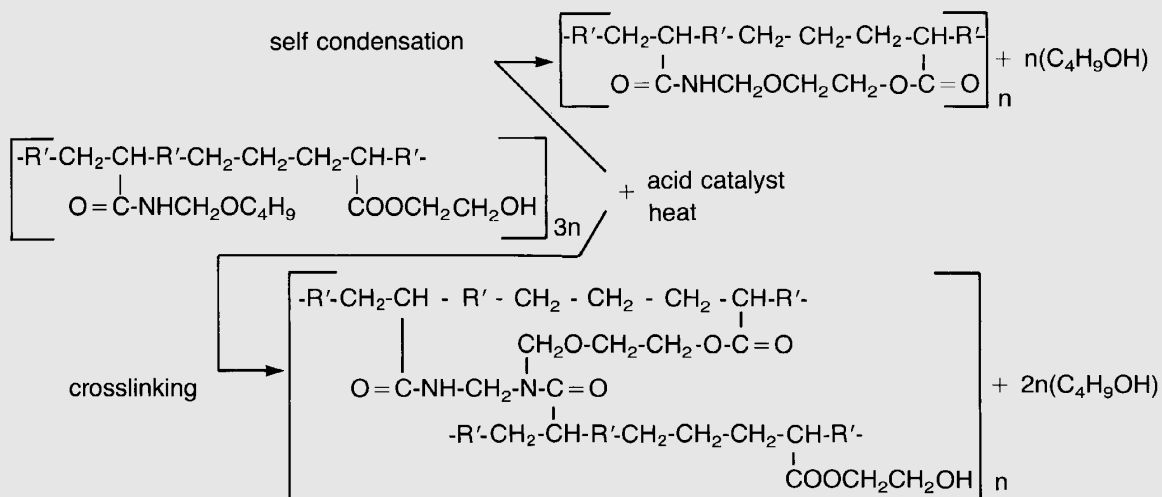
a. Hydroxyl group (intermolecular)



R' = vinyl polymer backbone

R'' = polymer or substrate containing hydroxyl groups

b. Hydroxyl group (intramolecular)



Thermal gas chromatographic studies by Bassett, Sherwin and Hager⁴ showed that evolution of formaldehyde took place at very high temperatures (255°C) when a strong acid catalyst (1% p-TSA) was used, and

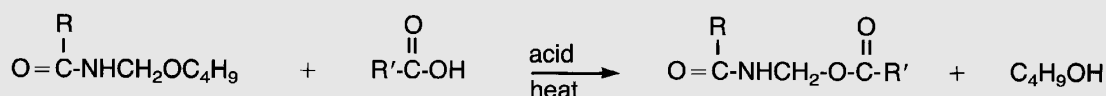
only after all the isobutanol had evolved. Thus, for normal cure temperature no release of formaldehyde should be evident as depicted by the equations above.

⁴ "Study of Latex Crosslinking by Thermal Evolution Techniques", Bassett, D.R., Sherwin, M.A. and Hager, S.L.; *Journal of Coatings Technology*, 51, No. 657, 65-72 (1979).

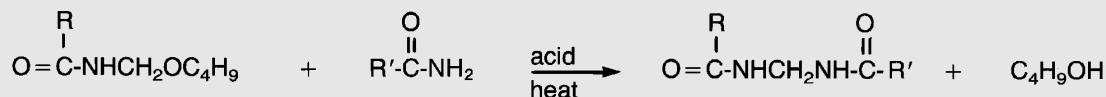
Reaction with Carboxyl and Amine Groups

Reaction with these groups follows the same pattern of crosslinking shown for the hydroxyl group. These reactions are depicted below showing only the reactive groups of the polymer backbone.

Carboxyl group



Amine group



R = polymer R' = polymer

Polymerization: Recipes, Procedures and Properties

IBMA can be readily copolymerized with most monomers by either solution or emulsion polymerization. Much work has been done with this monomer and many examples are available from the literature, including application test data related to the use of the resulting polymers. This work is summarized and referenced in the IBMA "Use and Applications" brochure.

Procedure:

1. Heat reactor charge to 80°C.
2. Add 0.3 g azobisisobutyronitrile dissolved in 12g of 1:1 toluene:n-butanol and stir at 80°C for 2 hours.
3. Add a second 0.3g portion azobisisobutyronitrile dissolved in 12g of 1:1 toluene:n-butanol and stir at 80°C for 3 hours to complete polymerization.

Solutions Copolymerization of IBMA-Modified Acrylic System

The following is a typical procedure for the preparation of a copolymer made by solution polymerization:

60 Methyl Methacrylate / 35 Ethyl Acrylate / 5 IBMA

| <u>Reactor Charge</u> | <u>with IBMA</u> <u>phm</u> | <u>without IBMA</u> <u>phm</u> |
|-----------------------|--------------------------------|-----------------------------------|
| Methyl methacrylate | 60 | 63 |
| Ethyl acrylate | 35 | 37 |
| IBMA | 5 | 0 |
| Toluene | 63 | 63 |
| n-Butanol | 63 | 63 |

Solution Copolymer Properties

| <u>Property</u> | <u>with IBMA</u> | <u>without IBMA</u> |
|--|------------------|---------------------|
| Solids, % | 40 | 40 |
| Conversion, % | 99.8 | 99.8 |
| Appearance | clear, colorless | clear, colorless |
| Viscosity, @ 25°C, cps ⁷ | 1200 | 1315 |
| Acetone solubility of films ⁸ | | |
| 30 minutes at 175°C no catalyst | Insoluble | Soluble |
| 5 minutes at 150°C 1% CYCAT 4040 ⁹ | Insoluble | Soluble |

The acetone solubility test clearly shows the crosslinking feature of a polymer system provided by the incorporation of IBMA in the polymer backbone.

IBMA-Modified Acrylic Polymer Containing Hydroxyl Pendant Group - Effect of Catalyst and Temperatures on Cure

The solution polymers listed below were coated on metal (aluminum 1200S) and the film thickness, hardness, adhesion and solvent resistance were determined. The results obtained indicate that IBMA copolymers can be post-cured under milder conditions through the use of combinations of heat, acid catalysts and other functional monomers, i.e., 2-hydroxyethyl acrylate (HEA).

| | 43.5 MMA / 43.5 BA / 5 HEA / 8 IBMA ¹⁰ | | | | 45 MMA / 34 BA / 10 HEA / 11 IBMA ¹⁰ | | | |
|--|---|-----|-----|-----|---|-----|-----|-----|
| Mole Ratio IBMA/HEA | 1.3 | 1.3 | 1.3 | 1.3 | 0.9 | 0.9 | 0.9 | 0.9 |
| CYCAT 4040 ⁹ , % | 0.5 | 0.5 | 0.5 | 0.5 | 0 | 0 | 0 | 0 |
| Cure Temperature, °C (10-min.) | 93 | 121 | 149 | 177 | 93 | 121 | 149 | 177 |
| Film thickness, mil | 0.8 | 0.8 | 0.8 | 0.8 | - | 1.0 | 1.0 | 1.1 |
| Knoop Hardness | | | | | | | | |
| initial | 2.1 | 2.6 | 3.3 | 3.3 | - | 1.0 | 1.5 | 2.0 |
| after 10 days | - | - | - | - | - | 1.0 | 1.5 | 2.0 |
| after 50 days | - | - | - | - | - | 1.0 | 1.5 | 2.0 |
| Reverse Impact resistance, in-lb | 20 | 40 | 40 | 50 | - | <10 | <10 | <10 |
| Adhesion, cross-hatch | pass | | | | pass | | | |
| Solvent resistance, MEK double rubs | 5 | 10 | 10 | 10 | - | - | <2 | 2-3 |

⁷ Brookfield RVF viscometer, No. 3 spindle at 20 rpm

⁸ 5-mil wet films cast on glass

⁹ p-Toluene sulfonic acid, a product of Cytec Industries Inc.

¹⁰ MMA = methyl methacrylate, BA = butyl acrylate,
HEA = hydroxyethyl acrylate, IBMA = (iso-butoxymethyl) Acrylamide

| | 45 MMA / 29.3 BA / 10 HEA / 15.7 IBMA ¹⁰ | | | | 45 MMA / 25 BA / 10 HEA / 20 IBMA ¹⁰ | | | | |
|--|---|-----|-----|-----|---|------|------|------|------|
| Mole Ratio IBMA/HEA | 1.3 | 1.3 | 1.3 | 1.3 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 |
| CYCAT 4040 ⁹ , % | 0.5 | 0.5 | 0.5 | 0.5 | 0 | 0 | 0 | 0 | 0.5 |
| Cure Temperature, °C (10-min.) | 93 | 121 | 149 | 177 | 93 | 121 | 149 | 177 | 121 |
| Film thickness, mil | 0.8 | 0.8 | 0.8 | 0.8 | 0.9 | 0.9 | 1 | 1 | 0.7 |
| Knoop Hardness | | | | | | | | | |
| initial | 3.4 | 5.4 | 5.2 | 6.7 | 3.1 | 6.7 | 7.0 | 9.3 | 14.8 |
| after 10 days | 3.3 | 5.2 | 5.8 | 8.3 | 3.2 | 6.8 | 7.8 | 11.5 | - |
| after 50 days | 5.0 | 6.8 | 7.7 | 9.3 | 5.0 | 10.3 | 10.8 | 12.1 | - |
| Pencil Hardness | - | - | - | - | - | - | - | - | H-2H |
| Reverse Impact | | | | | | | | | |
| resistance, in-lb | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Adhesion, cross-hatch | pass | | | | pass | | | | |
| Solvent resistance, MEK double rubs | - | - | <5 | 20 | - | - | 5-10 | 20 | 200+ |

IBMA-Modified Acrylic Polymer Containing Both Hydroxyl and Carboxyl Pendant Groups - Effect of Catalyst and Temperatures on Cure

A solution polymer of 36.5 BA / 36.5 MMA / 10 HEMA / 7 AA / 10 IBMA¹¹ was prepared. The polymer solution was used, with or without the addition of 0.6% CYCAT 4040⁹ catalyst, to cast films on steel panels. The panels were cured for 15 minutes at various temperatures. The cure performance of IBMA-containing coatings were determined by Knoop hardness, pencil hardness and MEK rub resistance. The results, as shown below, suggest that in this particular system, with both hydroxyl and carboxyl pendant groups present, IBMA can be cured at 85°C with the addition of catalyst (at 135°C in the absence of catalyst).

| | 36.5 BA / 36.5 MMA / 10 HEMA / 7 AA / 10 IBMA ¹¹ | | | | | |
|--|---|------|------|------|-------|------|
| CYCAT 4040 ⁹ , % | 0 | 0.6 | 0 | 0.6 | 0 | 0.6 |
| Cure Temperature, °C (15-min.) | 85 | 85 | 107 | 107 | 135 | 135 |
| Film thickness, mil | 0.93 | 0.93 | 1.02 | 1.04 | 1.01 | 1.03 |
| Knoop Hardness | 2.2 | 6.3 | 2.9 | 7.8 | 8.4 | 8.4 |
| Pencil Hardness | 2B-B | H-2H | HB-F | H-2H | 2H-3H | H-2H |
| Solvent Resistance, MEK double rubs | 4 | 60 | 5 | 0 | 200+ | 140 |

⁹ *p*-Toluene sulfonic acid, a product of Cytec Industries Inc.

¹⁰ MMA = methyl methacrylate, BA = butyl acrylate, HEA = hydroxyethyl acrylate, IBMA = (iso-butoxymethyl) Acrylamide

¹¹ weight ratio
BA = butyl acrylate, MMA = methyl methacrylate, HEMA = hydroxyethyl methacrylate, AA = acrylic acid, IBMA = (iso-butoxymethyl) Acrylamide

Emulsion Polymerization

An 55 Ethyl Acrylate / 40 Methyl Methacrylate / 5 IBMA polymer emulsion was prepared and compared with an 55 Ethyl Acrylate / 45 Methyl Methacrylate polymer emulsion.

A three-neck flask, fitted with stirrer, condenser, nitrogen inlet tube and dropping funnel is placed into a heated bath. The monomers are charged according to the procedure outlined below:

| <u>Reactor Charge</u> | <u>with IBMA phm</u> | <u>without IBMA phm</u> |
|--------------------------------|--------------------------|-----------------------------|
| AEROSOL® A-102 | | |
| Surfactant ¹² (31%) | 6.6 | 6.6 |
| Ammonium persulfate | 0.2 | 0.2 |
| Water, deionized | 140 | 140 |

Monomer Mix

| | | |
|---------------------|----|----|
| Ethyl acrylate | 55 | 55 |
| Methyl methacrylate | 40 | 45 |
| IBMA | 5 | 0 |

Procedure:

1. Purge reactor charge with nitrogen for 15 minutes and heat to 60°C.
2. Add 10% of the monomer mixture dropwise at 60°C; stirrer speed at 250 rpm. Wait for initiation (initiation can be detected either by a slight exotherm or a blue tint appearance to the reaction mixture). Add remainder of monomer mixture dropwise over a 3-hour period at 60°C.
3. Stir an additional one hour at 60°C.
4. Post-add 3.4 phm AEROSOL A-102 Surfactant, cool and filter.

Typical Acrylic Latex Properties

| <u>Property</u> | <u>with IBMA</u> | <u>without IBMA</u> |
|--------------------------------------|------------------|---------------------|
| Total solids, % | 40 | 40 |
| Conversion, % | 99 + | 99 + |
| Coagulum, % | 0.3 | 0.2 |
| Viscosity, @ 25°C, cps ¹³ | 15 | 12 |
| Particle size, average | | |
| peak range, nm | 50-75 | 50-100 |
| Mechanical stability | good | good |
| Surface tension, dynes/cm | 47.5 | 45.2 |
| pH | 5.5 | 5.3 |

Typical Acrylic Latex Film Properties¹⁴

| <u>Property</u> | <u>with IBMA</u> | <u>without IBMA</u> |
|-----------------------|------------------|---------------------|
| Acetone solubility: | | |
| 5 days @ 23°C | Soluble | Soluble |
| 1 hour @ 100°C | Swells | Soluble |
| 1 hour @ 150°C | Insoluble | Soluble |
| Tensile strength, psi | | |
| 5 days @ 23°C | 570 | 0 |
| 1 hour @ 100°C | 600 | 0 |
| 1 hour @ 150°C | 1350 | 0 |

Even though no curing catalyst was added to this acrylic IBMA polymer emulsion, the prepared film could be crosslinked by heating alone, whereas the film from the polymer emulsion containing no IBMA could not, as shown by the acetone solubility test data.

For additional formulating information, contact your local Cytec sales representative or the Process Chemicals Technical Service Department.

¹² Product of Cytec Industries Inc.

¹³ Brookfield LVT viscometer, No. 1 spindle, 60 rpm

¹⁴ No curing catalyst was used in preparing these latex films.

NOTE: 5-mil wet cast films.

Heat Aging of Latex Polymer Films

Polyacrylate and poly(vinyl acetate) latices were prepared containing 10% IBMA and the yellowing of the films was determined as a function of time and temperature. The data indicate that IBMA /acrylate and IBMA /vinyl acetate copolymer latex films yellowed less on exposure at 149°C than corresponding copolymer films containing no IBMA. Air-dried, 2-mil wet cast films on glass were exposed in a 149°C circulating air oven for 0, 2, 6, and 24 hours. Yellowness index determinations were conducted using a Photovolt Model 670 Reflection Meter. The values obtained are tabulated below:

Film Yellowness Index Data¹⁵

| <u>Polymer Composition</u> ¹⁶ | <u>0 Hours</u> | <u>Exposure Time @ 149°C (300°F)</u> | | |
|--|----------------|--------------------------------------|----------------|-----------------|
| | | <u>2 Hours</u> | <u>6 Hours</u> | <u>24 Hours</u> |
| 65 EA/35 MMA | - 0.009 | + 0.048 | + 0.080 | + 0.113 |
| 58.5 EA/31.5 MMA/10 IBMA | - 0.0 | + 0.0029 | + 0.029 | + 0.067 |
| 84 VA/16 EHA | - 0.003 | + 0.019 | + 0.025 | + 0.040 |
| 75.6 VA/14.4 EHA/10 IBMA | + 0.011 | + 0.011 | + 0.019 | + 0.040 |

Properties of IBMA Homopolymer

The glass transition temperature (T_g) of IBMA homopolymer prepared in solution is 48°C. The T_g was measured by differential scanning calorimetry at 10°C/min. heating rate in nitrogen.

The refractive index (n_D^{25}) of IBMA homopolymer is 1.493.

Health and Safety Information

Toxicity

Acute oral (rat) and acute dermal (rabbit) LD₅₀ values are 1000 mg/kg and 857 mg/kg, respectively. Mild skin irritation and mild eye irritation were produced during primary irritation studies with rabbits. The 4-hour LC₅₀ is greater than 2500 ppm. This material, therefore, is slightly toxic and the standard precautions normally exercised in handling toxic materials should be followed.

CYLINK IBMA Monomer contains materials which may cause nervous system damage. It also contains formaldehyde and other materials which caused cancer in laboratory animals. Acrylamide caused male reproductive disorders in laboratory animal tests. Refer to the Cytec Material Safety Data Sheet (MSDS) before using this product.

¹⁵ ASTM D2244-68

¹⁶ EA = ethyl acrylate, MMA = methyl methacrylate, VA = vinyl acetate, IBMA = (iso-butoxymethyl) Acrylamide, EHA = 2-ethylhexyl acrylate

Handling, Waste Disposal, Spill and Leak Procedures

Utilize a closed system process where feasible. Where a closed system is not used, good enclosure and local exhaust ventilation should be provided to minimize exposure. After Acrylamide is in solution, exposure to liquid and mist must be controlled. Food, beverages and tobacco products should not be carried, stored or consumed where this chemical is in use. Before eating, drinking or smoking, wash face and hands with soap and water. Shower after completion of workshift. Launder work clothing at end of workshift prior to reuse. Store street clothing separately from work clothing and protective equipment. Work clothing and shoes must not be taken home. Where adequate engineering controls are in effect, and measurements confirm airborne concentrations are below the Permissible Exposure Level, no respiratory protection is required. NIOSH does not approve a cartridge respirator for use with Acrylamide. However, tests conducted show that organic vapor cartridges provide protection from airborne levels up to 2.5 mg/M³. THE CARTRIDGES MUST BE CHANGED AT THE BEGINNING OF EACH SHIFT. Full facepiece, positive pressure, supplied air respirators or self-contained breathing apparatus must be used for higher or for unknown concentrations. Full facepiece respirators provide additional eye protection where handling makes it desirable. Note that Acrylamide exhibits no warning properties at concentrations at or below the Permissible Exposure Level. Wear the following to prevent skin contact: impervious rubber or plastic gloves, rubber shoes and long sleeved coveralls, which are provided clean daily. For operations where eye and face contact with Acrylamide solution can occur, wear chemical splash-proof goggles, a faceshield and head covering. WASH GLOVES THOROUGHLY BEFORE REMOVING AND DISCARD GLOVES THAT ARE CONTAMINATED ON THE INSIDE. When solutions are used, provide eyewash fountain and safety shower in close proximity to points of potential exposure.

Steps To Be Taken in Case Material is Released or Spilled

1. Remove sources of ignition.
2. Where exposure level is not known, wear NIOSH approved, positive pressure, self-contained respirator. Where exposure level is known, wear NIOSH approved respirator suitable for level of exposure. In addition to the protective clothing/equipment, wear impervious boots. Cover spills with some inert absorbent material; sweep up and place in a waste disposal container. Flush area with water.

TSCA Information

This product is manufactured in compliance with all provisions of the Toxic Substances Control Act, 15 U.S.C.

IMPORTANT NOTICE

The information and statements herein are believed to be reliable but are not to be construed as a warranty or representation for which we assume legal responsibility or as an assumption of a duty on our part. Users should undertake sufficient verification and testing to determine the suitability for their own particular purpose of any information, products or vendors referred to herein. NO WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS MADE. Nothing herein is to be taken as permission, inducement or recommendation to practice any patented invention without a license.

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