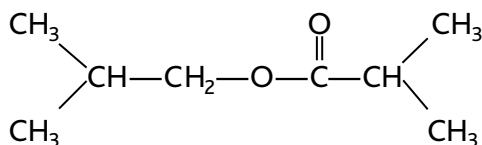


# Solvents

## Eastman isobutyl isobutyrate (IBIB)



### Introduction

Eastman isobutyl isobutyrate (IBIB) is an economical ester retarder solvent that is used in nitrocellulose lacquers, coatings for plastic substrates, and high-solids coatings. The major features of this product are its urethane-grade quality, ideal evaporation rate as a retarder solvent for

nitrocellulose lacquers, good solvent activity for numerous polymers, low weight/gallon, low water miscibility, low surface tension, high electrical resistance, and low solvent crazing of plastic substrates.

Table 1 Comparison of properties of Eastman retarder solvents

|   | IBIB <sup>a</sup> | PMA <sup>b</sup> | MAK <sup>c</sup> | EEP <sup>d</sup> | <i>n</i> -BuOPr <sup>e</sup> |
|---|-------------------|------------------|------------------|------------------|------------------------------|
| Urethane grade  | Yes               | Yes              | Yes              | Yes              | Yes                          |
| Evaporation rate<br><i>n</i> -BuOAc = 1               | 0.4               | 0.4              | 0.4              | 0.12             | 0.5                          |
| Ethyl ether = 1                                       | 30.2              | 30.2             | 30.2             | 100.8            | 24.2                         |
| Blush resistance, % relative humidity @ 26.7°C (80°F) | 92                | 92               | 93               | 94               | —                            |
| Weight/volume @20°C (68°F)<br>kg/L                    | 0.86              | 0.97             | 0.82             | 0.95             | 0.87                         |
| lb/gal  | 7.13              | 8.06             | 6.80             | 7.91             | 7.30                         |
| Water miscibility, wt%<br>In water                    | <0.1              | 20.0             | 0.5              | 2.9              | 0.4                          |
| Water in  | 0.2               | 5.9              | 1.3              | 2.2              | 0.7                          |
| Surface tension,<br>Dynes/cm, @ 20°C (68°F)           | 23.2              | 26.4             | 26.1             | 27.0 (@ 23°C)    | 25.3                         |
| Electrical resistance,<br>megohms                     | >20               | 5                | 0.4              | 20               | >20                          |

<sup>a</sup>Eastman isobutyl isobutyrate

<sup>b</sup>Eastman PM acetate

<sup>c</sup>Eastman methyl *n*-amyl ketone

<sup>d</sup>Eastman EEP solvent

<sup>e</sup>Eastman *n*-butyl propionate

## Solvents

### Eastman isobutyl isobutyrate (IBIB) (Continued)

## Urethane grade

IBIB is a urethane-grade solvent with very low water miscibility which aids in maintaining its urethane-grade quality during proper storage.

## Ideal evaporation rate as a retarder solvent for nitrocellulose lacquers

The evaporation rate (0.4) of IBIB enables formulators to design lacquer coatings with relatively fast dry-to-touch time combined with excellent blush resistance.

## Good solvent activity for many polymers

As a high-boiling, branched-chain ester solvent, IBIB has good solvent activity for polymers such as nitrocellulose, polyesters, alkyds, acrylic copolymers, amino resins, isocyanates, polyamides, and chlorinated rubber, as shown in Table 2. IBIB offers low cost and good application characteristics to a diverse range of coatings.

Table 2 Polymer solution viscosities in Eastman retarder solvents

| Polymer   | Viscosity @ 25°C, cP (mPa·s) |                  |        |       |       |                 |
|---|------------------------------|------------------|--------|-------|-------|-----------------|
|   | Wt%                          | IBIB             | PMA    | MAK   | EEP   | <i>n</i> -BuOPr |
| RS ½-sec nitrocellulose   | 8                            | 100              | 64     | 25    | 80    | 109             |
| High-solids polyester<br>Polymac™ HS 5776                                 | 65                           | 212              | 254    | 123   | 210   | 155             |
| Alkyd<br>Duramac™ HS 5720   | 65                           | 898              | 785    | 581   | 752   | 1,140           |
| Melamine<br>Cymel™ 303 resin  | 50                           | 8                | 10     | 7     | 14    | 7               |
| Isocyanate<br>Desmodur™ N-100 resin                                       | 50                           | 15               | 18     | 11    | 31    | 15              |
| Polyamide<br>Versamid™ 115 resin  | 75                           | 3,300            | 3,250  | 4,000 | 3,650 | PS <sup>a</sup> |
| High-solids acrylic<br>Joncryl™ 587 resin                                 | 60                           | 20,900           | 11,200 | 3,150 | 8,750 | 15,617          |
| Methyl methacrylate/butyl<br>methacrylate acrylic<br>Paraloid™ B-66 resin | 40                           | 4,150            | 3,000  | 580   | 2,800 | 878             |
| Methyl methacrylate acrylic<br>Elvacite™ 2010 resin                       | 20                           | INS <sup>b</sup> | 275    | 220   | 315   | INS             |
| Epoxy<br>Epon™ 1001F resin  | 50                           | INS              | 240    | 82    | 190   | 117             |
| Vinyl<br>Ucar™ VYHH   | 10                           | INS              | 67     | 16    | PS    | INS             |
| Phenoxy<br>Paphen™ PKHH   | 25                           | INS              | 2,600  | INS   | 2,300 | INS             |
| Cellulose acetate butyrate<br>CAB-381-0.5                                 | 8                            | INS              | 43     | 20    | 54    | 116             |

<sup>a</sup>Partially soluble

<sup>b</sup>Insoluble

## Solvents

### Eastman isobutyl isobutyrate (IBIB) *(Continued)*

#### Low weight/gallon

IBIB has one of the lowest weight/gallon (7.13 pounds) of any ester solvent available. EPA guidelines limit the maximum weight of a solvent for a given volume of coating; therefore, solvents with lower density contribute to lower VOC.

#### Exempt under SARA III, Section 313, and HAPs regulations

In the United States, Xylene emissions are reportable under SARA, Title III, Section 313 (TRI list), and Title III of the Clean Air Act Amendments of 1990 (HAPs). A blend of IBIB and VM&P™ naphtha (56.4/43.6 weight) is an effective xylene replacement in many coating formulations. Isobutyl acetate should be substituted for some or all of the VM&P™ naphtha when the aliphatic hydrocarbon tolerance of the coating is low or when additional solvent activity is needed.

However, in electrostatically applied coatings, where xylene is used to adjust electrical resistance, a 60/20/20 blend of IBIB, isobutyl acetate, and VM&P™ naphtha or an 80/20 blend of *n*-butyl acetate and IBIB may be more effective as replacements.

#### Low water miscibility

With low water miscibility, IBIB is an excellent retarder solvent for moisture-sensitive coatings such as polyurethanes. However, if a slower retarder solvent is required for a polyurethane coating, Eastman EEP solvent affords an improved balance of properties while maintaining low moisture sensitivity.

#### Low surface tension

High-solids coatings tend to have higher surface tension than low-solids coatings. High surface tension can be a contributing factor to poor coating atomization, poor wetting of the substrate, or film defects such as craters, fish eyes, and edge pull. One way to reduce the surface tension of a high-solids coating is to use a low-surface-tension solvent such as IBIB.

#### High resistivity

IBIB has high electrical resistance, which is helpful in adjusting the resistivity of a coating applied electrostatically. Generally, alcohols and ketones (low resistivity) are used in high-solids coatings to maintain package stability and lower viscosity. The addition of IBIB to high-solids coatings should enable formulators to adjust electrical resistance without sacrificing package stability and/or application viscosity.

#### Low solvent crazing of plastics

In coatings for plastic substrates, many retarder solvents with high activity have a tendency to craze the plastic surface and lower its impact strength. Because of its balance of evaporation rate and good solvent activity, IBIB is useful as a retarder solvent in coatings for plastic substrates that are sensitive to solvent attack.

## Solvents

### Eastman isobutyl isobutyrate (IBIB) *(Continued)*

## Resin suppliers

|   |                          |
|---|--------------------------|
| Paraloid™ B-66 methyl methacrylate/butyl methacrylate acrylic resin | Dow Chemical Company     |
| CAB-381-0.5 cellulose acetate butyrate                              | Eastman Chemical Company |
| Cymel™ 303 melamine resin   | Cytec                    |
| Desmodur™ N-100 isocyanate resin                                    | Bayer Material Science   |
| Duramac™ HS 5776  | PCCR USA                 |
| Elvacite™ 2010 methyl methacrylate acrylic resin                    | Lucite                   |
| Epon™ 1001F epoxy resin   | Momentive                |
| Joncryl™ 587 acrylic resin  | BASF                     |
| Paphen™ PKHH phenoxy resin  | Phenoxy Associates       |
| Polymac™ HS 5720  | PCCR USA                 |
| RS ½-sec nitrocellulose   | Various suppliers        |
| Versamid™ 115 polyamide resin                                       | BASF                     |
| Ucar™ VYHH vinyl resin  | Dow Chemical Company     |



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