

## **Eastman EastaPure**<sup>™</sup> electronic chemicals

EB solvent

Eastman EastaPure EB Solvent (ethylene glycol monobutyl ether) is a high boiling, slow evaporating, and water miscible solvent providing low trace metals content for sensitive electronic applications. High-purity specifications (low trace metals) are required for solvents in semiconductor chip manufacturing, and special handling and storage procedures are used to maintain the high-purity specifications. EastaPure EB Solvent is designed for photoresist applications/formulations, specifically for photoresist removers/strippers.

Special analytical tests are used to measure critical trace metals in parts-per-billion levels (Table 1). Listed in Table 2 are some typical properties and regulatory classifications for EastaPure EB solvent.

| Table 1: | Special | properties, <sup>a</sup> | upper | limits | for | trace | metals |
|----------|---------|--------------------------|-------|--------|-----|-------|--------|
|          | -       |                          |       |        |     |       |        |

| Component                           | Upper limit (parts/billion) |  |  |  |
|-------------------------------------|-----------------------------|--|--|--|
| Aluminum (Al), ppb                  |                             |  |  |  |
| Barium (Ba), ppb                    | _                           |  |  |  |
| Cadmium (Cd), ppb                   | _                           |  |  |  |
| Calcium (Ca), ppb                   | _                           |  |  |  |
| Chromium (Cr), ppb                  |                             |  |  |  |
| Cobalt (Co), ppb                    |                             |  |  |  |
| Copper (Cu), ppb                    |                             |  |  |  |
| Gallium (Ga), ppb                   | _                           |  |  |  |
| Germanium (Ge), ppb                 | _                           |  |  |  |
| Iron (Fe), ppb                      |                             |  |  |  |
| Lead (Pb), ppb                      | - 100 MAX                   |  |  |  |
| Lithium (Li), ppb                   | - 100 MAX                   |  |  |  |
| Magnesium (Mg), ppb                 | _                           |  |  |  |
| Manganese (Mn), ppb                 | _                           |  |  |  |
| Nickel (Ni), ppb                    | _                           |  |  |  |
| Potassium (K), ppb                  |                             |  |  |  |
| Silver (Ag), ppb                    | _                           |  |  |  |
| Sodium (Na), ppb                    | -                           |  |  |  |
| Strontium (Sr), ppb                 | _                           |  |  |  |
| Titanium (Ti), ppb                  |                             |  |  |  |
| Tin (Sn), ppb                       | _                           |  |  |  |
| Zinc (Zn), ppb                      |                             |  |  |  |
| al istad in the Salas Specification |                             |  |  |  |

<sup>a</sup>Listed in the Sales Specification

## Table 2: Typical properties<sup>a</sup>

| Acidity as acetic acid     0.01 wt% max.       Assay     99.0 wt% min.       Autoignition temperature     238°C (460°F)       Azectropes     BP       BP     98.8°C (209.8°F)       Wt% water     79.2 wt%       Blush resistance @80°F (26.7°C)     96% RH       Boiling point @ 760 mm Hg     169°C (336°F)       Dry point     172.5°C (343°F)       Color Pt-Co     10 max.       Critical pressure     32 ATM       Critical reperature     326.8°C       Critical volume     400 mL/g mol       Dilution ratio     Toluene       Toluene     3.4       VM&P Naphtha     2.1       Electrical resistance     <0.2 Meghms       Empirical formula     CefH <sub>4</sub> O <sub>2</sub> Evaporation rate     0.09       (n-butyl acetate = 1)     0.09       (rh-butyl acetate = 1)     0.09       (rh-butyl acetate = 1)     0.09       Icetware @ 93°C     12.7 Vol%       Fire point     70°C (158°F)       Fire point     70°C (158°F)       Free point     70°C (158°F)       Tag open cup     70°C (158°F)       Freezing point     -75°C (-103°F)       Hansen solubility parameters, [cal/cm²] <sup>1/2</sup> Nonpola       Nonpola     7.8       Pol  | Property                              | Typical value, units                          |  |  |  |
|---|---------------------------------------|---|--|--|--|
| Assay         99.0 wt% min.           Autoignition temperature         238°C (460°F)           Azetoropes         BP           BP         98.8°C (209.8°F)           Wt% water         79.2 wt%           Blush resistance @ 80°F (26.7°C)         96% RH           Boiling point @ 760 mm Hg         169°C (336°F)           Dry point         172.5°C (343°F)           Color Pt-Co         10 max.           Critical pressure         32.4 TM           Critical pressure         32.4 TM           Critical pressure         3.4           VM&P Naphtha         2.1           Electrical resistance         <0.2 Megohms   |                                       |   |  |  |  |
| Azeotropes<br>BP98.8°C (209.8°F)Wt% water99.8°C (209.8°F)Wt% water79.2 wt%Blush resistance @ 80°F (26.7°C)96% RHBoiling point @ 760 mm Hg<br>Initial169°C (336°F)Dry point172.5°C (343°F)Color Pt-Co10 max.Critical pressure32 ATMCritical temperature326.8°CCritical volume400 mL/g molDilution ratioTolueneToluene3.4VM&R Naphtha2.1Electrical resistance<0.2 Megohms   |                                       | 99.0 wt% min.                                 |  |  |  |
| BP98.8°C (209.8°F)Wt% water79.2 wt%Blush resistance @ 80°F (26.7°C)96% RHBolling point @ 760 mm Hg<br>Initial169°C (336°F)Dry point172.5°C (343°F)Color Pt-Co10 max.Critical pressure32.ATMCritical temperature326.8°CCritical temperature3.4VM&P Naphtha2.1Electrical resistance<0.2 Megohms   | Autoignition temperature              | 238°C (460°F)                                 |  |  |  |
| Wt% water79.2 wt%Blush resistance @ 80°F (26.7°C)96% RHBoiling point @ 760 mm Hg<br>Initial169°C (336°F)Dry point172.5°C (343°F)Color Pt-Co10 max.Critical pressure32 ATMCritical temperature326.8°CCritical volume400 mL/g-molDilution ratio70Toluene3.4VM&P Naphtha2.1Electrical resistance<0.2 Megohms   | Azeotropes                            |   |  |  |  |
| Blush resistance @ 80°F (26.7°C)     96% RH       Boiling point @ 760 mm Hg     169°C (336°F)       Dry point     172.5°C (343°F)       Color Pt-Co     10 max.       Critical pressure     32 ATM       Critical temperature     326.8°C       Critical volume     400 mL/g.mol       Dilution ratio     10       Toluene     3.4       VM&P Naphtha     2.1       Electrical resistance     <0.2 Megohms  |                                       | 98.8°C (209.8°F)                              |  |  |  |
| Boiling point @ 760 mm Hg169°C (336°F)Initial172.5°C (343°F)Color Pt-Co10 max.Critical pressure32 ATMCritical remperature326.8°CCritical remperature326.8°CCritical volume400 mL/g-molDilution ratio1Toluene3.4VM&P Naphtha2.1Electrical resistance<0.2 Megohms   | Wt% water                             | 79.2 wt%                                      |  |  |  |
| Initial169°C (336°F)Dry point172.5°C (343°F)Color Pt-Co10 max.Critical pressure32 ATMCritical remperature326.8°CCritical volume400 mL/g·molDilution ratio   | Blush resistance @ 80°F (26.7°C)      | 96% RH  |  |  |  |
| Dry point172.5°C (343°F)Color Pt-Co10 max.Critical pressure32 ATMCritical volume400 mL/g:molDilution ratio3.4Toluene3.4VM&P Naphtha2.1Electrical resistance<0.2 Megohms   | Boiling point @ 760 mm Hg             |   |  |  |  |
| Color Pt-Co10 max.Critical pressure32 ATMCritical temperature326.8°CCritical volume400 mL/g molDilution ratio1Toluene3.4VM&P Naphtha2.1Electrical resistance<0.2 Megohms  | Initial                               | 169°C (336°F)                                 |  |  |  |
| Critical pressure32 ATMCritical volume400 mL/g.molDilution ratio400 mL/g.molToluene3.4VM&P Naphtha2.1Electrical resistance<0.2 Megohms  | Dry point                             | 172.5°C (343°F)                               |  |  |  |
| Critical temperature326.8°CCritical volume400 mL/g.molDilution ratio3.4Toluene3.4VM&P Naphtha2.1Electrical resistance<0.2 Megohms   | Color Pt-Co                           | 10 max.                                       |  |  |  |
| Critical volume400 mL/g.molDilution ratio3.4Toluene3.4VM&P Naphtha2.1Electrical resistance<0.2 Megohns  | Critical pressure                     | 32 ATM  |  |  |  |
| Dilution ratio       3.4         Toluene       3.4         VM&P Naphtha       2.1         Electrical resistance       <0.2 Megohms  | Critical temperature                  | 326.8°C                                       |  |  |  |
| Toluene $3.4$ VM&P Naphtha $2.1$ Electrical resistance<0.2 Megohms  | Critical volume                       | 400 mL/g∙mol                                  |  |  |  |
| VM&P Naphtha2.1Electrical resistance<0.2 Megohms  |                                       |   |  |  |  |
| Electrical resistance<0.2 MegohmsEmpirical formula $C_{\rm g}H_{14}O_2$ Evaporation rate<br>(n-butyl acetate = 1)0.09(ethyl ether = 1)136Expansion coefficient, per °C @ 20°C0.00092Explosive limits in air<br>Lower @ 93°C1.1 Vol%Upper @ 135°C12.7 Vol%Fire point70°C (158°F)Flash point62°C (143°F)Tag closed cup62°C (143°F)Tag open cup70°C (158°F)Freezing point-75°C (-103°F)Hansen solubility parameters, [cal/cm³] <sup>1/2</sup> Nonpolar7.8Polar2.5Hydrogen bonding6.0Total10.2Heat of combustion-848.5 kcal/g·molHeat of vaporization11060 cal/g·molLiquid heat capacity @ 25°C65.49 cal/(g·mol)(°C)Liquid viscosity @ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight111ANITrocellulose solubilityActiveRefractive index @ 20°C1.4193Solubility20°CSolubility20°CVapor density (air = 1)4.1Vapor density (air = 1)4.1Vapor density (air = 1)4.1Vapor density (air = 1)4.1Vapor density (air = 1)4.1  |                                       |   |  |  |  |
| Empirical formula $C_eH_{14}O_2$ Evaporation rate<br>(n-butyl acetate = 1)0.09(ethyl ether = 1)136Expansion coefficient, per °C @ 20°C0.00092Explosive limits in air<br>Lower @ 93°C1.1 Vol%Upper @ 135°C12.7 Vol%Fire point70°C (158°F)Flash point<br>Tag closed cup62°C (143°F)Tag closed cup70°C (158°F)Freezing point-75°C (-103°F)Hansen solubility parameters, [cal/cm³] <sup>1/2</sup><br>Nonpolar7.8Polar2.5Hydrogen bonding6.0Total10.2Heat of combustion-848.5 kcal/g·molHeat of vaporization11060 cal/g·molLiquid heat capacity @ 25°C65.49 cal/(g·mol)(°C)Liquid viscosity @ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight111ANITrocellulose solubilityActiveRefractive index @ 20°C1.4193Solubility<br>in water, @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor density (air = 1)4.1Vapor density (air = 1)4.1Vapor density (air = 1)0.6 mm Hg<br>@ 25°C@ 20°C0.97 KPa   | VM&P Naphtha                          |   |  |  |  |
| Evaporation rate<br>(n-butyl acetate = 1)0.09(ethyl ether = 1)136Expansion coefficient, per °C @ 20°C0.00092Explosive limits in air<br>Lower @ 93°C1.1 Vol%Upper @ 135°C12.7 Vol%Fire point70°C (158°F)Flash point62°C (143°F)Tag closed cup62°C (143°F)Tag open cup70°C (158°F)Freezing point-75°C (-103°F)Hansen solubility parameters, [cal/cm³] <sup>1/2</sup> NonpolarNonpolar7.8Polar2.5Hydrogen bonding6.0Total10.2Heat of combustion-848.5 kcal/g-molLiquid heat capacity@ 25°C65.49 cal/(g-mol)[°C)Liquid heat capacity@ 25°C3.3 cP (mPa-s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight118.17NFPA Classification 30IIIANitrocellulose solubilityActiveRefractive index @ 20°C0.902Surface tension @ 20°C26.6 dynes/cmTuV PPM 201520Vapor density (air = 1)4.1Vapor pressure@ 20°C@ 20°C0.6 mm Hg@ 20°C0.97 KPa  |                                       | <0.2 Megohms                                  |  |  |  |
| $\begin{tabular}{ c c c c c } \hline 0.09 \\ \hline (ethyl ether = 1) & 136 \\ \hline Expansion coefficient, per °C @ 20 °C & 0.00092 \\ \hline Explosive limits in air & 1.1 Vol% \\ \hline Upper @ 135 °C & 12.7 Vol% \\ \hline \hline Fire point & 70 °C (158 °F) \\ \hline \hline Flash point & 62 °C (143 °F) \\ \hline \hline Tag closed cup & 62 °C (143 °F) \\ \hline \hline Tag closed cup & 70 °C (158 °F) \\ \hline \hline Freezing point & -75 °C (-103 °F) \\ \hline \hline Hansen solubility parameters, [cal/cm³]1/2 & 7.8 \\ \hline Polar & 2.5 \\ \hline \hline Hydrogen bonding & 6.0 \\ \hline \hline Total & 10.2 \\ \hline \hline Heat of combustion & -848.5 kcal/g-mol \\ \hline Iciquid heat capacity @ 25 °C & 65.49 cal/(g-mol)(°C) \\ \hline Liquid heat capacity @ 25 °C & 3.3 cP (mPa-s) \\ \hline Max. incremental reactivity (MIR), g O_3/g VOC & 2.9 \\ \hline Molecular weight & 118.17 \\ \hline NFPA Classification 30 & IIIA \\ \hline Nitrocellulose solubility & Active \\ \hline Refractive index @ 20 °C & 0.902 \\ \hline Surface tension @ 20 °C & Complete \\ \hline Vater in, @ 20 °C & Complete \\ \hline Specific gravity @ 20 °C & 0.902 \\ \hline Surface tension @ 20 °C & 0.6 mm Hg \\ @ 20 °C & 0.97 KPa \\ \hline \ensure tension & 0.07 KPa \\ \hline \ensu$ | Empirical formula                     | C <sub>6</sub> H <sub>14</sub> O <sub>2</sub> |  |  |  |
| Item136Expansion coefficient, per °C @ 20°C0.00092Explosive limits in airIntermLower @ 93°C1.1 Vol%Upper @ 135°C12.7 Vol%Fire point70°C (158°F)Flash point62°C (143°F)Tag closed cup62°C (143°F)Tag open cup70°C (158°F)Freezing point-75°C (-103°F)Hansen solubility parameters, [cal/cm³] <sup>1/2</sup> NonpolarNonpolar7.8Polar2.5Hydrogen bonding6.0Total10.2Heat of combustion-848.5 kcal/g·molHeat of vaporization11060 cal/g·molLiquid heat capacity @ 25°C65.49 cal/(g·mol)(°C)Liquid viscosity @ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight118.17NFPA Classification 30IIIANitrocellulose solubilityActiveRefractive index @ 20°CCompleteSolubility20°CWater in, @ 20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure@ 20°C@ 20°C0.6 mm Hg@ 20°C0.97 KPa   | •                                     | 0.00  |  |  |  |
| Expansion coefficient, per °C @ 20°C0.00092Explosive limits in air<br>Lower @ 93°C1.1 Vol%Upper @ 135°C12.7 Vol%Fire point70°C (158°F)Flash point<br>Tag closed cup62°C (143°F)Tag closed cup62°C (103°F)Freezing point-75°C (-103°F)Hansen solubility parameters, [cal/cm³] <sup>1/2</sup> 7.8Polar2.5Hydrogen bonding6.0Total10.2Heat of combustion-848.5 kcal/g·molLiquid heat capacity @ 25°C65.49 cal/(g·mol)(°C)Liquid heat capacity @ 25°C65.49 cal/(g·mol)(°C)Liquid viscosity @ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight1118.17NFPA Classification 30IIIIANitrocellulose solubility<br>in water, @ 20°CCompleteSolubility<br>in water, @ 20°C20Complete20Vapor density (air = 1)4.1Vapor pressure<br>@ 20°C0.97 KPa   | · · · · · · · · · · · · · · · · · · · |   |  |  |  |
| Explosive limits in air<br>Lower @ 93°C1.1 Vol%Upper @ 135°C12.7 Vol%Fire point70°C (158°F)Flash point70°C (158°F)Tag closed cup62°C (143°F)Tag open cup70°C (158°F)Freezing point-75°C (-103°F)Hansen solubility parameters, [cal/cm³] <sup>1/2</sup> 7.8Polar2.5Hydrogen bonding6.0Total10.2Heat of combustion-848.5 kcal/g·molLiquid heat capacity @ 25°C65.49 cal/(g·mol)(°C)Liquid viscosity @ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight1118.17NFPA Classification 30IIIANitrocellulose solubilityActiveRefractive index @ 20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure@ 20°C@ 20°C0.97 KPa  |                                       |   |  |  |  |
| Lower @ 93°C1.1 Vol%Upper @ 135°C12.7 Vol%Fire point70°C (158°F)Flash point62°C (143°F)Tag closed cup62°C (143°F)Tag open cup70°C (158°F)Freezing point $-75°C (-103°F)$ Hansen solubility parameters, [cal/cm³] <sup>1/2</sup> 7.8Polar2.5Hydrogen bonding6.0Total10.2Heat of combustion $-848.5$ kcal/g·molHeat of vaporization11060 cal/g·molLiquid heat capacity @ 25°C65.49 cal/(g·mol)[°C)Liquid viscosity @ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight118.17NFPA Classification 30IIIANitrocellulose solubilityActiveRefractive index @ 20°C0.902Solubility20°CWater in, @ 20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure@ 20°C@ 20°C0.6 mm Hg@ 20°C0.97 KPa  | ·                                     | 0.00092                                       |  |  |  |
| Upper @ 135°C12.7 Vol%Fire point70°C (158°F)Flash point62°C (143°F)Tag closed cup70°C (158°F)Tag open cup70°C (158°F)Freezing point $-75°C (-103°F)$ Hansen solubility parameters, [cal/cm³] <sup>1/2</sup> NonpolarNonpolar7.8Polar2.5Hydrogen bonding6.0Total10.2Heat of combustion $-848.5$ kcal/g·molHeat of vaporization11060 cal/g·molLiquid heat capacity @ 25°C65.49 cal/(g·mol)(°C)Liquid viscosity @ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight118.17NFPA Classification 30IIIANitrocellulose solubilityActiveRefractive index @ 20°CCompleteWater in, @ 20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure@ 20°C@ 20°C0.6 mm Hg@ 20°C0.97 KPa   | •                                     | 11 \/ol%                                      |  |  |  |
| Fire point70°C (158°F)Flash point62°C (143°F)Tag closed cup62°C (143°F)Tag open cup70°C (158°F)Freezing point-75°C (-103°F)Hansen solubility parameters, [cal/cm³] <sup>1/2</sup> NonpolarNonpolar7.8Polar2.5Hydrogen bonding6.0Total10.2Heat of combustion-848.5 kcal/g·molHeat of vaporization11060 cal/g·molLiquid heat capacity@ 25°C65.49 cal/(g·mol)(°C)Liquid viscosity@ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight118.17NFPA Classification 30IIIANitrocellulose solubilityActiveRefractive index @ 20°CCompleteWater in, @ 20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure@ 20°C@ 20°C0.6 mm Hg@ 20°C0.97 KPa  |                                       |   |  |  |  |
| Flash point62°C (143°F)Tag closed cup62°C (143°F)Tag open cup70°C (158°F)Freezing point-75°C (-103°F)Hansen solubility parameters, [cal/cm³] <sup>1/2</sup> NonpolarNonpolar7.8Polar2.5Hydrogen bonding6.0Total10.2Heat of combustion-848.5 kcal/g·molHeat of vaporization11060 cal/g·molLiquid heat capacity @ 25°C65.49 cal/(g·mol)(°C)Liquid viscosity @ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight118.17NFPA Classification 30IIIANitrocellulose solubilityActiveRefractive index @ 20°C0.902SolubilityCompleteWater in, @ 20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure0.6 mm Hg@ 20°C0.97 KPa   |                                       |   |  |  |  |
| Tag closed cup         62°C (143°F)           Tag open cup         70°C (158°F)           Freezing point         -75°C (-103°F)           Hansen solubility parameters, [cal/cm³] <sup>1/2</sup> Nonpolar           Nonpolar         7.8           Polar         2.5           Hydrogen bonding         6.0           Total         10.2           Heat of combustion         -848.5 kcal/g·mol           Heat of vaporization         11060 cal/g·mol           Liquid heat capacity@ 25°C         65.49 cal/(g·mol)(°C)           Liquid viscosity@ 20°C         3.3 cP (mPa·s)           Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC         2.9           Molecular weight         118.17           NFPA Classification 30         IIIIA           Nitrocellulose solubility         Active           Refractive index@ 20°C         Complete           Water in,@ 20°C         Complete           Water in,@ 20°C         0.902           Surface tension @ 20°C         26.6 dynes/cm           TLV PPM 2015         20           Vapor density (air = 1)         4.1           Vapor pressure         @ 20°C         0.6 mm Hg           @ 20°C         0.6 mm Hg         @ 20°C         0.97 KPa <td></td> <td>70 C (156 F)</td>   |                                       | 70 C (156 F)                                  |  |  |  |
| Tag open cup70°C (158°F)Freezing point-75°C (-103°F)Hansen solubility parameters, [cal/cm³] <sup>1/2</sup>  |                                       | 62°C (143°F)                                  |  |  |  |
| Freezing point-75°C (-103°F)Hansen solubility parameters, [cal/cm³] <sup>1/2</sup> 7.8Nonpolar7.8Polar2.5Hydrogen bonding6.0Total10.2Heat of combustion-848.5 kcal/g·molHeat of vaporization11060 cal/g·molLiquid heat capacity@ 25°C65.49 cal/(g·mol)(°C)Liquid viscosity@ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight118.17NFPA Classification 30IIIANitrocellulose solubilityActiveRefractive index@ 20°C0.902SolubilityCompleteWater in, @ 20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure0.6 mm Hg@ 20°C0.97 KPa  |                                       |   |  |  |  |
| Hansen solubility parameters, [cal/cm³] <sup>1/2</sup> 7.8Polar2.5Hydrogen bonding6.0Total10.2Heat of combustion-848.5 kcal/g·molHeat of vaporization11060 cal/g·molLiquid heat capacity @ 25°C65.49 cal/(g·mol)(°C)Liquid viscosity @ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight118.17NFPA Classification 30IIIIANitrocellulose solubilityActiveRefractive index @ 20°C1.4193SolubilityCompleteWater in, @ 20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure0.6 mm Hg@ 20°C0.97 KPa  |                                       |   |  |  |  |
| Nonpolar7.8Polar2.5Hydrogen bonding6.0Total10.2Heat of combustion848.5 kcal/g·molHeat of vaporization11060 cal/g·molLiquid heat capacity @ 25°C65.49 cal/(g·mol)(°C)Liquid viscosity @ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g $O_3/g$ VOC2.9Molecular weight118.17NFPA Classification 30IIIANitrocellulose solubilityActiveRefractive index @ 20°C1.4193SolubilityCompleteWater in, @ 20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure0.6 mm Hg@ 20°C0.97 KPa   |                                       |   |  |  |  |
| Hydrogen bonding6.0Total10.2Heat of combustion-848.5 kcal/g·molHeat of vaporization11060 cal/g·molLiquid heat capacity@ 25°C65.49 cal/(g·mol)(°C)Liquid viscosity@ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight118.17NFPA Classification 30IIIANitrocellulose solubilityActiveRefractive index@ 20°C1.4193Solubilityin water, @ 20°CWater in, @ 20°CCompleteSpecific gravity@ 20°C/20°C0.902Surface tension@ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure0.6 mm Hg@ 20°C0.97 KPa  |                                       | 7.8   |  |  |  |
| Total10.2Heat of combustion-848.5 kcal/g-molHeat of vaporization11060 cal/g-molLiquid heat capacity @ 25°C65.49 cal/(g-mol)(°C)Liquid viscosity @ 20°C3.3 cP (mPa-s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight118.17NFPA Classification 30IIIANitrocellulose solubilityActiveRefractive index @ 20°C1.4193Solubilityin water, @ 20°CWater in, @ 20°CCompleteWater in, @ 20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure0.6 mm Hg@ 20°C0.97 KPa  | Polar                                 | 2.5   |  |  |  |
| Heat of combustion848.5 kcal/g·molHeat of vaporization11060 cal/g·molLiquid heat capacity @ 25°C65.49 cal/(g·mol)(°C)Liquid viscosity @ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight118.17NFPA Classification 30IIIANitrocellulose solubilityActiveRefractive index @ 20°C1.4193Solubilityin water, @ 20°CWater in, @ 20°CCompleteWater in, @ 20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure@ 20°C@ 20°C0.6 mm Hg@ 55°C0.97 KPa  | Hydrogen bonding                      | 6.0   |  |  |  |
| Heat of vaporization11060 cal/g·molLiquid heat capacity @ 25°C65.49 cal/(g·mol)(°C)Liquid viscosity @ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight118.17NFPA Classification 30IIIANitrocellulose solubilityActiveRefractive index @ 20°C1.4193SolubilityInterferencein water, @ 20°CCompleteWater in, @ 20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure0.6 mm Hg@ 20°C0.97 KPa  | Total                                 | 10.2  |  |  |  |
| Heat of vaporization11060 cal/g·molLiquid heat capacity @ 25°C65.49 cal/(g·mol)(°C)Liquid viscosity @ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight118.17NFPA Classification 30IIIANitrocellulose solubilityActiveRefractive index @ 20°C1.4193SolubilityInterferencein water, @ 20°CCompleteWater in, @ 20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure0.6 mm Hg@ 20°C0.97 KPa  | Heat of combustion                    | –848.5 kcal/g·mol                             |  |  |  |
| Liquid heat capacity @ 25°C65.49 cal/(g·mol)(°C)Liquid viscosity @ 20°C3.3 cP (mPa·s)Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC2.9Molecular weight118.17NFPA Classification 30IIIANitrocellulose solubilityActiveRefractive index @ 20°C1.4193Solubilityin water, @ 20°CWater in, @ 20°CCompleteWater in, @ 20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure0.6 mm Hg@ 20°C0.97 KPa   | Heat of vaporization                  |   |  |  |  |
| Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC       2.9         Molecular weight       118.17         NFPA Classification 30       IIIA         Nitrocellulose solubility       Active         Refractive index @ 20°C       1.4193         Solubility       Complete         Water in, @ 20°C       Complete         Specific gravity @ 20°C/20°C       0.902         Surface tension @ 20°C       26.6 dynes/cm         TLV PPM 2015       20         Vapor density (air = 1)       4.1         Vapor pressure       0.6 mm Hg         @ 20°C       0.97 KPa   | · · · · · · · · · · · · · · · · · · · | 65.49 cal/(g·mol)(°C)                         |  |  |  |
| Max. incremental reactivity (MIR), g O <sub>3</sub> /g VOC       2.9         Molecular weight       118.17         NFPA Classification 30       IIIA         Nitrocellulose solubility       Active         Refractive index @ 20°C       1.4193         Solubility       Complete         Water in, @ 20°C       Complete         Specific gravity @ 20°C/20°C       0.902         Surface tension @ 20°C       26.6 dynes/cm         TLV PPM 2015       20         Vapor density (air = 1)       4.1         Vapor pressure       0.6 mm Hg         @ 20°C       0.97 KPa   | Liquid viscosity @ 20°C               | 3.3 cP (mPa·s)                                |  |  |  |
| Molecular weight118.17NFPA Classification 30IIIANitrocellulose solubilityActiveRefractive index @ 20°C1.4193Solubilityin water, @ 20°CWater in, @ 20°CCompleteWater in, @ 20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure0.6 mm Hg@ 20°C0.97 KPa   |                                       | 2.9   |  |  |  |
| Nitrocellulose solubilityActiveRefractive index @ 20°C1.4193Solubility<br>in water, @ 20°CCompleteWater in, @ 20°CCompleteSpecific gravity @ 20°C/20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure<br>@ 20°C0.6 mm Hg@ 55°C0.97 KPa   |                                       | 118.17  |  |  |  |
| Refractive index @ 20°C1.4193Solubility<br>in water, @ 20°CCompleteWater in, @ 20°CCompleteSpecific gravity @ 20°C/20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure<br>@ 20°C0.6 mm Hg@ 55°C0.97 KPa  |                                       | IIIA  |  |  |  |
| Refractive index @ 20°C1.4193Solubility<br>in water, @ 20°CCompleteWater in, @ 20°CCompleteSpecific gravity @ 20°C/20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure<br>@ 20°C0.6 mm Hg@ 55°C0.97 KPa  | Nitrocellulose solubility             | Active  |  |  |  |
| Solubility<br>in water, @ 20°CCompleteWater in, @ 20°CCompleteSpecific gravity @ 20°C/20°C0.902Surface tension @ 20°C26.6 dynes/cmTLV PPM 201520Vapor density (air = 1)4.1Vapor pressure<br>@ 20°C0.6 mm Hg@ 55°C0.97 KPa   |                                       | 1.4193  |  |  |  |
| in water, @ 20°C         Complete           Water in, @ 20°C         Complete           Specific gravity @ 20°C/20°C         0.902           Surface tension @ 20°C         26.6 dynes/cm           TLV PPM 2015         20           Vapor density (air = 1)         4.1           Vapor pressure         0.6 mm Hg           @ 20°C         0.97 KPa  |                                       |   |  |  |  |
| Specific gravity @ 20°C/20°C         0.902           Surface tension @ 20°C         26.6 dynes/cm           TLV PPM 2015         20           Vapor density (air = 1)         4.1           Vapor pressure  | -                                     | Complete                                      |  |  |  |
| Surface tension @ 20°C         26.6 dynes/cm           TLV PPM 2015         20           Vapor density (air = 1)         4.1           Vapor pressure   | Water in, @ 20°C                      | Complete                                      |  |  |  |
| TLV PPM 2015         20           Vapor density (air = 1)         4.1           Vapor pressure  | Specific gravity @ 20°C/20°C          | 0.902   |  |  |  |
| Vapor density (air = 1)         4.1           Vapor pressure  | Surface tension @ 20°C                | 26.6 dynes/cm                                 |  |  |  |
| Vapor pressure         0.6 mm Hg           @ 20°C         0.6 mm Hg           @ 55°C         0.97 KPa   | TLV PPM 2015                          |   |  |  |  |
| Vapor pressure         0.6 mm Hg           @ 20°C         0.6 mm Hg           @ 55°C         0.97 KPa   | Vapor density (air = 1)               | 4.1   |  |  |  |
| @ 55°C 0.97 KPa   | Vapor pressure                        |   |  |  |  |
|   |                                       | 0.6 mm Hg                                     |  |  |  |
| Wt/Vol @ 20°C 0.9 kg/L (7.51 lb/gal)  | @ 55°C                                | 0.97 KPa                                      |  |  |  |
|   | Wt/Vol@20°C                           | 0.9 kg/L (7.51 lb/gal)                        |  |  |  |

<sup>a</sup>Physical properties are typical of average lots. Eastman makes no representation that the material in any particular shipment will conform exactly to the values given.



Eastman Chemical Company Corporate Headquarters P.O. Box 431 Kingsport, TN 37662-5280 U.S.A.

U.S.A. and Canada, 800-EASTMAN (800-327-8626) Other Locations, +(1) 423-229-2000

www.eastman.com/locations

Although the information and recommendations set forth herein are presented in good faith, Eastman Chemical Company and its subsidiaries make no representations or warranties as to the completeness or accuracy thereof. You must make your own determination of its suitability and completeness for your own use, for the protection of the environment, and for the health and safety of your employees and purchasers of your products. Nothing contained herein is to be construed as a recommendation to use any product, process, equipment, or formulation in conflict with any patent, and we make no representations or warranties, express or implied, that the use thereof will not infringe any patent. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS AND NOTHING HEREIN WAIVES ANY OF THE SELLER'S CONDITIONS OF SALE.

Safety Data Sheets providing safety precautions that should be observed when handling and storing our products are available online or by request. You should obtain and review available material safety information before handling our products. If any materials mentioned are not our products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be observed.

© 2015 Eastman Chemical Company. Eastman brands referenced herein are trademarks of Eastman Chemical Company or one of its subsidiaries. The ® used on Eastman brands denotes registered trademark status in the U.S.; marks may also be registered internationally. Other companies' brands referenced herein are trademarks of their respective owners.