

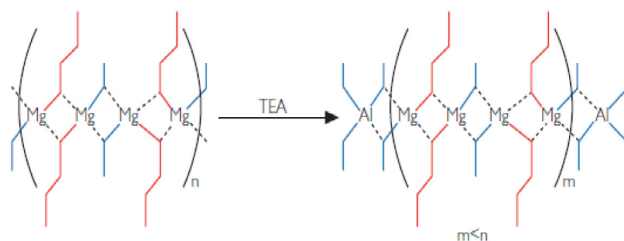
BEM

n-Butylethylmagnesium

| | |
|--------------------------|---|
| CAS Number | 62202-86-2 |
| EINECS/EC | 263-454-0 |
| Molecular Formula | $(\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2)(\text{CH}_3\text{CH}_2)\text{Mg}$ |

APPLICATION

BEM is provided in hydrocarbon solutions. It is used primarily in the manufacture of MgC_2 -based Ziegler-Natta olefin polymerization catalysts. BEM can also be used as an alkylating agent. BEM is currently sold in heptane, isohexane and isopentane at a typical concentration of 20 wt%. In solution, BEM exhibits a one-dimensional oligomeric structure associated by electron-deficient butyl and ethyl alkyl bridges. Without the use of a viscosity-reducing agent (VRA), typically triethylaluminum (TEA), BEM solutions would be highly viscous due to the associated structure. The VRA reduces the size of the BEM oligomers, and thus the viscosity, by forming strongly bound end-caps on the shortened oligomers. Therefore, the viscosity of a typical BEM solution can be reduced by simply increasing the content of the VRA.



SPECIFICATION

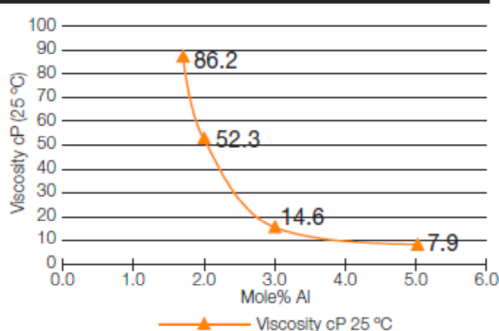
| | | 20% BEM in | | |
|-------|-------------|---------------|-------------|-------------|
| Units | | Heptane | Isohexane | Isopentane |
| BEM | Wt% range | 18.0 - 22.0 | 18.0 - 22.0 | 18.0 - 22.0 |
| Butyl | Mole% range | 45.0 - 55.0 | 45.0 - 55.0 | 45.0 - 55.0 |
| Ethyl | Mole% range | 45.0 - 55.0.1 | 45.0 - 55.0 | 45.0 - 55.0 |
| Al | Mole% | > 2.0 | > 4.7 | > 6.7 |
| Cl | ppm | < 2000 | < 2000 | < 2000 |

PHYSICAL PROPERTIES

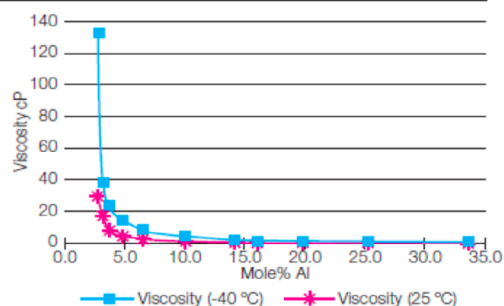
| | Units | 20% BEM in | | | Notes |
|-------------------------|-------|-----------------|-------------|------|---------------------|
| Density @ 25 °C | g/ml | 0.72 | | | 1.7 - 3.0 mole% Alb |
| Density @ 25 °C | | | 0.69 | | 2.8 - 33 mole% Al |
| Density @ 25 °C | | | | 0.67 | 10 mole% Al |
| Viscosity range @ 25 °C | cP | 86.2 - 7.9 | | | 1.7 - 5.0 mole% Al |
| Viscosity range @ 25 °C | | | 29.9 - 0.62 | 1.22 | 2.8 - 33 mole% Al |
| Viscosity @ 25 °C | | | | | |
| Pyrophoric | | > 10.0 mole% Al | Yes | Yes | 10 mole% Al |

ILLUSTRATIONS

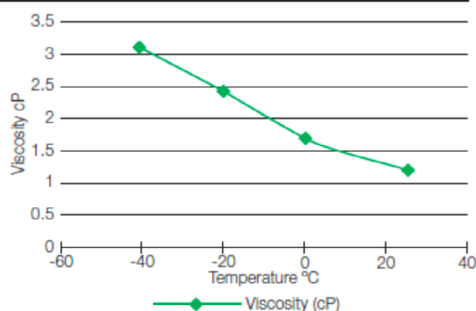
BEM 20% in Heptane
Viscosity vs Mole Ratio% Al



BEM 20% in Isohexane
Viscosity vs Mole Ratio% Al at 25 °C and -40 °C



BEM 20% in Isopentane (Mole% Al = 10)
Viscosity (cP) vs Temperature (°C)



HANDLING & STORAGE

As with any water reactive material, BEM solutions present potential hazards not common to most liquid chemicals. The pyrophoricity of 20% BEM solutions varies with the solvent and TEA concentration. Some of the solutions are classified as pyrophoric for transportation and can therefore spontaneously ignite if exposed to air, giving off dense smoke, heat and flammable vapors. BEM solutions, even if not classified as pyrophoric, will react violently with water and therefore water is not recommended as a fire-fighting medium. For specific information on the safe handling and toxicity of this product, please refer to the Material Safety Data Sheet, available upon request. For more detailed information and procedures for handling organometallics such as BEM, refer to Albemarle's 'Handling Procedures for Organometallics' manual, also available upon request.

TRANSPORT & PACKAGING

| Container Description | Nominal Value | | Approximate Loadings | |
|------------------------------------|---------------|---------------|----------------------|-----------------|
| | Gallons | Liters | Pounds | Kilograms |
| Tank Car (DOT-105A300W) | 23,000-25,100 | 87,100-95,000 | 135,000-230,000 | 61,400- 104,000 |
| Tank Trailer (DOT-MC330 or 331) | 6,200-7,200 | 23,500-27,200 | 30,00-48,000 | 13,600- 21,800 |
| Portable Tanks (DOT-51)/UN T21 | 430 | 1,635 | 2,250-3,800 | 1,021-1,725 |
| | 1,980 | 7,500 | 10,257-17,000 | 4,880-7,711 |
| Isotank | 5,635-5,970 | 21,330-22,600 | 30,000-34,000 | 13,600- 15,500 |
| Cylinders: dual valve (DOT-4BA240) | | | | |
| 5 gallon size | 5.7 | 22 | 25-53 | 11-24 |
| 26 gallon size | 28.0 | 106 | 150-268 | 68-120 |
| Laboratory cylinders (DOT-3AA2015) | | | | |
| 0.4 gallon size | 0.40 | 1.47 | 1.2-2.2 | 0.58-0.97 |
| 1.0 gallon size | 0.94 | 3.60 | 2.9-6.3 | 1.4-2.8 |

*Actual weight depends on highway load limits, product density and lifting considerations. Shipments are made in accordance with DOT regulations — Section 173.134. All containers are shipped blanketed with dry nitrogen under slight positive pressure. Hydrocarbon solutions are also available blended to customer specifications. Tank rail cars and tank trucks are available in North America only.

Transportation Classification

Non-Pyrophoric Solution

Proper shipping name ORGANOMETALLIC SUBSTRATE, LIQUID, WATER-REACTIVE, FLAMMABLE (N-BUTYLETHYLMAGNESIUM, METAL ALKYL, SOLVENT NAME)
 Hazard Class 4.3 (Dangerous when wet) 3 (flammable liquid)
 ID Number UN3399
 Placard (s..... spontaneously combustible with number 4 and with 3394 ID number, and dangerous when wet with number 4

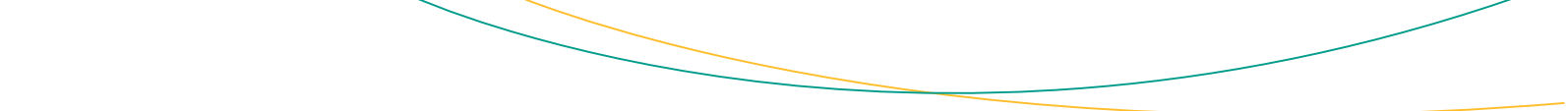
Pyrophoric Solution

Proper shipping name ORGANOMETALLIC SUBSTRATE, LIQUID, WATER-REACTIVE, (N-BUTYLETHYLMAGNESIUM, TRIETHYLALUMINUM)
 Hazard Class..... 4.2 (Spontaneously combustible) 4.3 (Dangerous when wet)
 ID Number UN3394
 Placard (s..... spontaneously combustible with number 4 and with 3394 ID number, and dangerous when wet with number 4

OTHER INFORMATION

Further Related Documents

Safety Data Sheet



The information presented herein is believed to be accurate and reliable, but is presented without guarantee or responsibility on the part of Albemarle Corporation and its subsidiaries and affiliates. It is the responsibility of the user to comply with all applicable laws and regulations and to provide for a safe workplace. The user should consider any health or safety hazards or information contained herein only as a guide, and should take those precautions which are necessary or prudent to instruct employees and to develop work practice procedures in order to promote a safe work environment. Further, nothing contained herein shall be taken as an inducement or recommendation to manufacture or use any of the herein materials or processes in violation of existing or future patent.

Technical data sheets may change frequently. You can download the latest version from our website www.albemarle.com.

Please contact us at www.albemarle.com/contact with questions.

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