

**HUNTSMAN**

Enriching lives through innovation

# Polysiloxane Modification



# Introduction

Amino functional polysiloxanes are widely used in textile industry as premium grade fabric softener in textile finishing in which the mostly adopted is the Aminoethylaminopropyl Poly(dimethylsiloxane) (Fig. 1). Because of the interactions of amino groups with textile materials, amino functional siloxanes are physically adsorbed onto the fiber surfaces, so that the fiber surface is covered by a layer of methyl, thereby increasing the smoothness of the fiber surface. With the presence of amino groups in the side chain, amino functional siloxanes can easily be emulsified by surfactant to stable micro-emulsion.

Although they are recognized as delivering premium softness, conventional amino polysiloxane formulations have their limitations. They are process-sensitive and must be emulsified using specific techniques to ensure stability. The yellowing may be resulted when amino polysiloxanes are used on white or light color fabrics due to the oxidation of pendant primary amino radicals in the presence of air, heat and light energy which results in the formation of azoxy compounds.

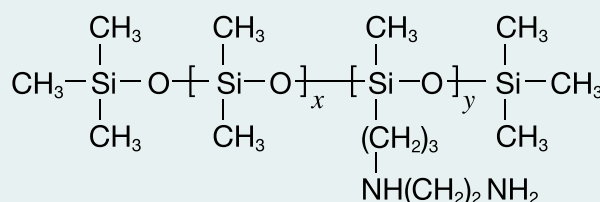


Fig. 1 Aminoethylaminopropyl Poly(dimethylsiloxane)

In addition, Polysiloxane are not compatible with some textile additives and process aids (certain permanent press resins, for example), which can lead to spotting problems if not properly applied. Another drawback is that the random distributed amino group will result in limited hydrophilicity and moderate soft hand feel. In addition, its emulsion stability is not good enough to make it stable and will have tendency to de-emulsify when it is subjected to harsh textile processing conditions such as high shearing force retendered by high speed machine such as jet dye exhaustion, the presence of other textile finish auxiliaries.

## POLYETHERAMINES MODIFIED POLYSILOXANE

In order to take advantage of the unique properties of polysiloxane meanwhile to overcome the disadvantages of side chain type amino polysiloxane, there are numerous applications and inventions are developed where PDMS (Fig. 2) have been copolymerized with a large number of different monomers. The essential goal in all these approaches is the effective combination of the silicone-specific features with those of the other polymer to obtain materials with a new set of properties.

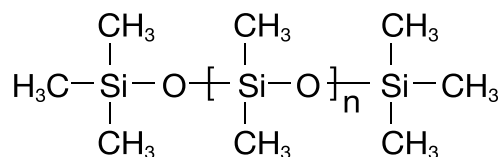


Fig. 2 Polydimethylsiloxane (PDMS)





One of typical developments is based on the approach where JEFFAMINE® and ELASTAMINE® polyetheramines (Fig. 3) are used in preparation of copolymers with polysiloxanes to make it more durable and hydrophilic. As a result, such block copolymer with typical molecular structure as illustrated in Fig 4 can provide smooth, softer hand feel to textile fabrics and emulsion stability compared to conventional amino hydrophobic Polysiloxane. Since there is no presence of primary amine after reaction, the tendency of yellowing is also reduced.

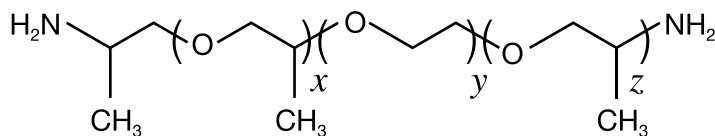


Fig. 3 JEFFAMINE® ED Series Polyetheramine

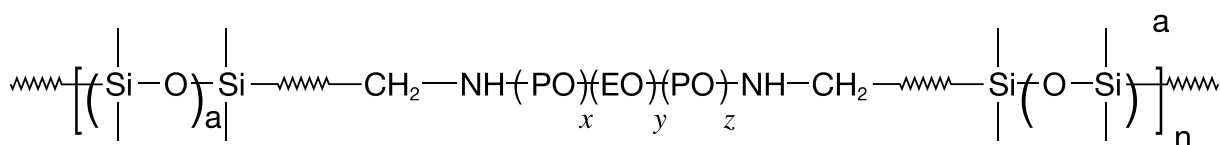


Fig. 4 Block copolymer siloxane

## Benefits

- Easy to react into polysiloxane backbone
- Improved emulsification
- Improved emulsion stability
- Improved compatibility with other textile auxiliary
- Enhanced soft / smooth hand feel
- Imparting unique surface and hand feel effects into textile fabrics
- Improved storage stability
- Improved processing stability in textile finish with higher resistance to shearing force, PH variation and electrolyte

## PRODUCT RANGE

Product Name	Backbone	Typical Properties*					
		Approx molecular weight	Appearance	Colour, Pt-Co	Water, wt%	Viscosity, cSt	AHEW (Amine Hydrogen Equivalent Weight)
JEFFAMINE® ED-410	PEG (mostly)/PPG Diamines	400	Colorless to pale yellow liquid with slight haze permitted	50 max	0.50 max	29 (25°C)	106
JEFFAMINE® ED-600	PEG (mostly)/PPG Diamines	600	Colorless to pale yellow liquid with slight haze permitted	75 max	0.35 max	72 (20°C)	132
JEFFAMINE® ED-900	PEG (mostly)/PPG Diamines	900	Colorless to pale yellow liquid with slight haze permitted	100 max	0.35 max	119 (25°C)	250
JEFFAMINE® ED-1200	PEG (mostly)/PPG Diamines	1,200	Colorless to pale yellow liquid with slight haze permitted	100 max	0.50 max	134 (50°C)	300
JEFFAMINE® ED-2003	PEG (mostly)/PPG Diamines	2,000	Colorless to pale yellow liquid with slight haze permitted	75 max	0.35 max	134 (50°C)	575
ELASTAMINE® HE-1000	Polyethylene glycol-based amine mixture	1000	White waxy solid, free of foreign material	75 max	0.50 max	40 (50°C)	217
ELASTAMINE® HE-1700	Polyethylene glycol-based amine mixture	1,700	White waxy solid, free of foreign material	50 Max	0.50 max	107 (50°C)	341

\* Properties are for reference only. Please approach Huntsman Corporation for actual specifications.



# HUNTSMAN

Enriching lives through innovation

## Global Headquarters

### Americas

Huntsman Corporation  
10003 Woodloch Forest Drive  
The Woodlands, Texas, 77380  
USA  
Tel : +1-281-719-6000

### Asia Pacific

Huntsman Performance Products  
No. 455 Wenjing Road  
Minhang Economic & Technological  
Development Zone  
Shanghai 200245  
P. R. China  
Tel : +86-21-3357-6588

### Europe, Middle East & Africa

Huntsman Performance Products  
Everslaan 45  
B-3078 Everberg  
Belgium  
Tel : +32-2-758-9544

**For more information, please contact  
your local Huntsman representative  
or drop us an email at  
[pp\\_enquiry@huntsman.com](mailto:pp_enquiry@huntsman.com)**

## About Huntsman

Huntsman Corporation is a publicly traded global manufacturer and marketer of differentiated and specialty chemicals with 2020 revenues of approximately \$6 billion. Our chemical products number in the thousands and are sold worldwide to manufacturers serving a broad and diverse range of consumer and industrial end markets. We operate more than 70 manufacturing, R&D and operations facilities in approximately 30 countries and employ approximately 9,000 associates within our four distinct business divisions. For more information about Huntsman, please visit the company's website at [www.huntsman.com](http://www.huntsman.com).

## Huntsman Performance Products

Performance Products brings together innovation and world-leading process technologies to produce components used to formulate products that enhance people's lives. Our leading global positions in the manufacture and sale of amines, maleic anhydride and carbonates enable us to serve diverse consumer and industrial end markets, including energy, automotive and transportation, coatings and adhesives, construction and infrastructure, electronics, and industrial manufacturing. With 10 manufacturing facilities in North America, Europe, the Middle East and Asia, we produce and sell over 350 products to over 900 global customers, and provide extensive pre- and post-sales technical service support. The division had 2020 revenues of USD 1 billion.

## Disclaimer

Huntsman Petrochemical LLC warrants only that its products meet the specifications stated herein, if any. Typical properties, where stated, are to be considered as representative of current production and should not be treated as specifications. While all the information presented in this document is believed to be reliable and to represent the best available data on these products, HUNTSMAN MAKES NO WARRANTY OR GUARANTEE OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHT OF ANY THIRD PARTY, OR WARRANTIES AS TO QUALITY OR CORRESPONDENCE WITH PRIOR DESCRIPTION OR SAMPLE, AND ANY USER OF PRODUCTS DESCRIBED HEREIN SHOULD CONDUCT A SUFFICIENT INVESTIGATION TO ESTABLISH THE SUITABILITY OF ANY PRODUCT FOR ITS INTENDED USE AND ASSUMES ALL RISK AND LIABILITY WHATSOEVER RESULTING FROM THE USE OF SUCH PRODUCT, WHETHER USED SINGLY OR IN COMBINATION WITH OTHER SUBSTANCES. Product(s) described in this publication may be hazardous and/or toxic and require special precautions in handling. For all product(s) described herein, the user should obtain from Huntsman detailed information on hazards and/or toxicity, together with proper shipping, handling, and storage procedures, and should comply with all applicable safety and environmental standards. The behavior, hazards and/or toxicity of the product(s) referred to in this publication in manufacturing processes and their suitability in any given end-use environment are dependent upon various conditions such as chemical compatibility, temperature, and other variables, which may not be known to Huntsman. It is the sole responsibility of the user of such product(s) to evaluate the manufacturing circumstances and the final product(s) under actual end-use requirements and to adequately advise and warn future purchasers and users thereof.

JEFFAMINE® and ELASTAMINE® are registered trademarks of Huntsman Corporation or an affiliate thereof in one or more, but not all, countries.

Copyright © 2021 Huntsman Corporation or an affiliate thereof. All rights reserved.

[www.huntsman.com/pp](http://www.huntsman.com/pp)