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 been emulsified by surfactant to stable micro-emulsion.

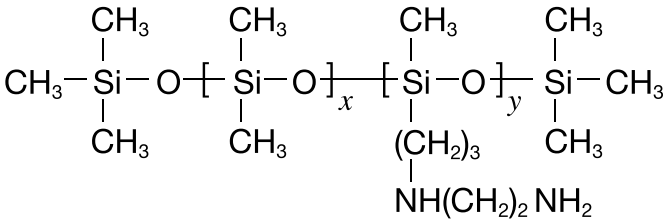

Fig. 1 Aminoethylaminopropyl Poly(dimethylsiloxane)

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. 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.

JEFFAMINE® 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.

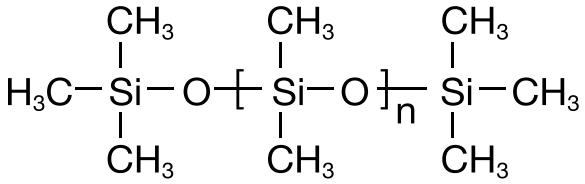

Fig. 2 Polydimethylsiloxane (PDMS)

One of typical developments is based on the approach where JEFFAMINE® 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, the tendency of yellowing is also reduced.

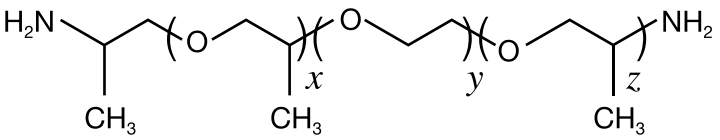

Fig. 3 JEFFAMINE® Polyetheramine ED Series

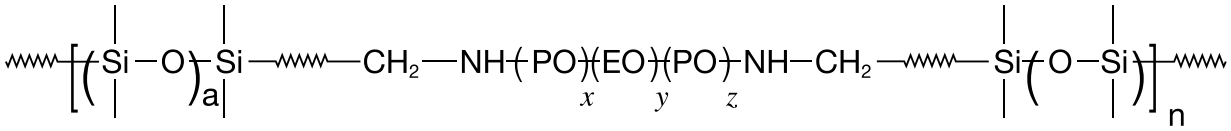

Fig. 4 Block copolymer siloxane

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 effcts 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)
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
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
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
HE-1700	Mixture of diamine and triamine (PEG backbone)	1,700	White waxy solid	50 Max	0.5 Max	107 (50ºC)	341
XTJ-512	Amine mixture (TEG Backbone)	356	Colorless to pale yellow liquid with slight haze permitted	125 Max	0.5 Max	9 (25ºC)	65

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

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