

Poly bd[®] Resin-Based Polyurethane Elastomers Accrue Production Benefits Due To Appropriate Selection of Plasticizers and Process Oils



Benefits

- Greater control over premix viscosity
- Extended gel time
- Reduced system cost
- Potential for increased filler loadings

Suggested Applications

- Elastomers
- Sealants
- Adhesives
- Encapsulants for electronics

Additional Information

MSDS/TDS: Poly bd[®] R45HTLO

Description

Poly bd[®] resins, because of their hydrocarbon backbones, are compatible with conventional hydrocarbon oils, chlorinated oils, asphalts and other related low cost materials. Such mixtures can be cured with conventional diisocyanates to yield oil-extended elastomers. The quantity of oil which can be incorporated into a Poly bd resin system is a function of the oil and the type of filler, if present. Cured Poly bd resin systems may be formulated which incorporate in excess of 100 parts oil per 100 parts Poly bd resin without noticeable bleeding of oil in the final product.

Diundecyl phthalate (DUP) and soybean oil (SB) were selected as extender examples and their effects on the physical properties of the polyurethane elastomers were evaluated. Conclusions and results are shown below.

Miscibility

DUP and SB were shown to be completely miscible in any ratio with Poly bd R-45HTLO resin as evidenced by the clarity of the resulting mixtures.

Thermogravimetric analysis (TGA)

Two polyurethane elastomers containing 20% DUP and SB, respectively, were subjected to TGA analysis in air atmosphere. The experiment indicated that the soybean oil was less volatile than DUP at elevated temperatures.

Physical properties for polyurethanes containing 20% plasticizer

The elastomer containing SB appeared to have slightly better tensile strength, modulus, and tear strength. The hardness and elongation are comparable for both formulations.

Formulation and Properties (20% Plasticizer)

Formula	1	2
Poly bd R-45HTLO	100	100
2-ethyl-1, 3-hexanediol (EHD)	12.29	12.29
Isonate® 143L*	36.55	36.55
Diundecyl phthalate	37.21	----
Soybean oil	-----	37.21
Dibutyltin dilaurate (drop)	1	1
Final Property Evaluation		
Appearance at room temperature	Yellow, clear	Yellow, hazy
Hardness, Shore A	60	64
Tensile strength, psi	468	541
Modulus, psi	152	194
Elongation at break, %	246	196
Tear strength, lbf / in	78	91

* Dow Chemical Co.

Physical properties for polyurethanes containing 40% plasticizer

Formulations having no chain extender, such as EHD, to strengthen the hard domain and loaded with a high amount of plasticizer were investigated. Both elastomers have reduced tensile properties and hardness as anticipated. The material containing SB had markedly improved elongation.

Formulation and Properties (40% Plasticizer)

Formula	1	2
Poly bd R-45HTLO	56.31	56.31
Isonate 143L	6.86	6.86
Diundecyl phthalate	42.0	---
Soybean oil	---	42.0
Dibutyltin dilaurate (drop)	3	3
Ralox® 46**	1.69	1.69
Final Property Evaluation		
Appearance at room temperature	Orange, clear, soft	Orange, clear, soft
Hardness, Shore 00	67	45
Tensile strength, psi	59.6	30.3
Modulus, psi	42.6	9.4
Elongation at break, %	84	247
Tear resistance, lbf / in	11.3	9.4

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Environmental impact

SB, one of the natural oils, is more “environmentally friendly” than DUP, which is derived synthetically from petroleum products.

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