Chemical Resistance Guide

Summary: Results of tests comparing the performance of ENGAGE™ Polyolefin Elastomers, INFUSE™ Olefin Block Copolymers, and VERSIFY™ Plastomers and Elastomers in contact with commercial solvents, oil, fuels, and lubricants.

Introduction

This study provides a comparison of the chemical resistance of ENGAGE™ Polyolefin Elastomers (POEs), INFUSE™ Olefin Block Copolymers (OBCs), and VERSIFY™ Plastomers and Elastomers in different chemical environments. A range of chemicals were chosen, including aqueous and oxygenated solvents selected from the ASTM D543-87 Standard Reagents List. In addition, some common fluids like gasoline, diesel, mineral oil, and turpentine were selected. The concept was to cover the broadest range of chemical environments considered most likely to be encountered in applications using these products. A selection of several grades with a range of densities and melt indices was used to allow better interpretation of trends.

ENGAGE™ POLYOLEFIN ELASTOMERS

INFUSE™ OLEFIN BLOCK COPOLYMERS

VERSIFY™ PLASTOMERS AND ELASTOMERS

Interpretation of Chemical Resistance Tables

The information pertaining to chemical resistance is intended to serve as a general guide. The information listed does not take into account all variables than can be encountered in actual use. Thus, it is advisable to test material under actual or simulated service conditions.

Rather than using absolute values, a rating system based on the degree of change in properties with chemical exposure was used to evaluate the samples. The rating is based on a combination of changes in hardness and tensile performance, therefore the results are relative to this grading.

Several trends are readily apparent:

- Overall chemical resistance improves with increasing density or molecular weight.
- All of the tested products have comparable chemical resistance when observed at comparable Shore A Hardness or crystallinity.
- All of these products do not perform as well in the chlorinated or hydrocarbon solvents. Results from this study showed that the lower density resins dissolved or swelled significantly.

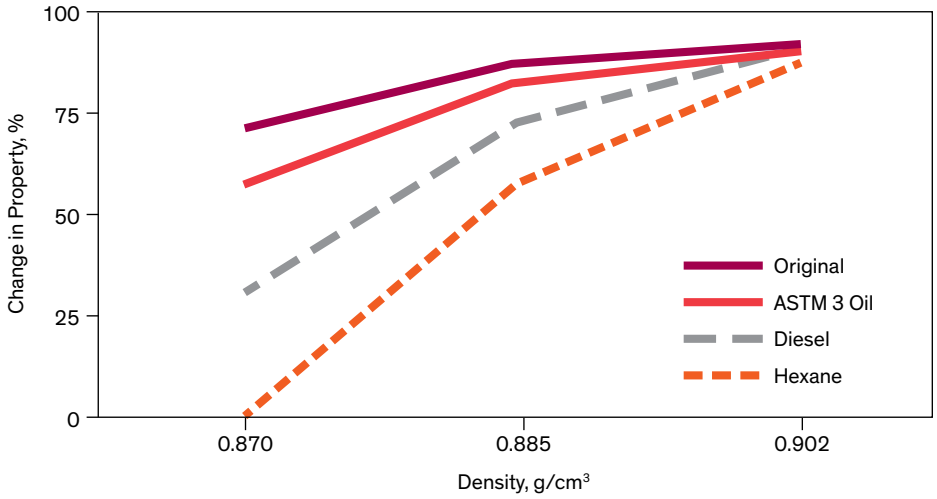
About the Test

Samples were tested in accordance with Federal Test Method Standard No. 601[1]; changes in mechanical and dimensional characteristics were determined after exposure to the chemicals. Plaques were compression molded from each product tested and microtensile and hardness samples were cut from the plaques. Hardness samples measured 3" x 1" x 1/16". Samples were immersed for a period of 46 hours at 23°C (73°F).

Following the immersion, the samples were removed from the chemicals and dried; their physical properties were tested within 30 minutes after removal from the liquid. Hardness, stress-strain behavior, and dimensional changes were recorded and compared against the original values obtained prior to immersion. The results are shown in Table 1 on the next page.

Figure 1 illustrates the hardness results for 1.0 MFI ENGAGE™ Polyolefin Elastomers (ethylene octene comonomer) in hydrocarbon solvents. The results suggest that the overall performance of ENGAGE™ EO resins is excellent in highly polar liquids such as the aqueous acids, bases, alcohols, glycols, esters, and ketones tested. There are some minor changes due to density and molecular weight differences, with improving resistance as density increases and melt index decreases.

Figure 1: Hydrocarbon Resistance of 1.0 MFI EO ENGAGE™ POEs[2]



[1] General liquid treatment tests for vulcanized and rubber-like materials.
[2] Data per tests conducted by Dow. Test protocols and additional information available upon request. Properties shown are typical, not to be construed as specifications. Users should confirm results by their own tests.

Table 1: Overall Chemical Resistance of ENGAGE™ Polyolefin Elastomers, INFUSE™ Olefin Block Copolymers, and VERSIFY™ Plastomers and Elastomers[1]

	ENGAGE™ POEs								VERSIFY™ Plastomers & Elastomers		INFUSE™ OBCs	
Grade	**8407**	**8401**	**8402**	**8100**	**8003**	**8480**	**7380**	**7270**	**2400**	**2000**	**9107**	**9100**
Density, g/cm^3	0.870	0.885	0.902	0.870	0.885	0.902	0.870	0.880	0.859	0.888	0.865	0.877
Melt Flow Index (MFI)	30.0	30.0	30.0	1.0	1.0	1.0	<0.5	0.8	2.0 230°C/ 2.16 kg	2.0 230°C/ 2.16 kg	7.2 190°C/ 2.16 kg	1.0 190°C/ 2.16 kg
Comonomer	**Octene**						**Butene**		**Ethylene**		**Octene**	
Shore A Hardness	72	85	94	75	86	94	68	78	68	94	63	75
Aqueous												
Deionized Water												
Hydrochloric Acid, 10%												
Nitric Acid, 10%												
Nitric Acid, 40%												
Nitric Acid, 50%												
Sodium Hydroxide, 50%												
Sulfuric Acid, 10%												
Sulfuric Acid, 30%												
Oxygenated Solvents												
Acetone												
Di-Ethylene Glycol												
Ethyl Acetate												
Ethyl Alcohol												
Ethylene Glycol												
Methyl Ethyl Ketone												
Methyl Isobutyl Ketone												
Propanol												
Hydrocarbons												
ASTM 3 Oil												
Diesel												
Gasoline												
Hexane												
Mineral Oil												
Toluene												
Turpentine												
Others												
Acetic Acid												
Chloroform												

Legend
(Change in Property) Good: 0-15% Fair: 15-50% Poor: >50% or Fail

[1] Data per tests conducted by Dow. Test protocols and additional information available upon request. Properties shown are typical, not to be construed as specifications. Users should confirm results by their own tests.

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