Eastman™
elastomers

EASTMAN

Specialty polymers and additives

for thermoplastic elastomer compounds

Contents

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for thermoplastic elastomer compounds

Eastman™ elastomers are unique polyester ethers that offer clarity and toughness over the extremely wide range of temperatures and chemical resistance required for a variety of demanding applications.

Three grades of Eastman™ elastomers — AP005, AP006 and AP007 — are commercially available to meet the requirements of the most prevalent polymer processing operations, including extrusion, injection molding and extrusion blow molding. Additionally, Eastman™ elastomers can be compounded or coextruded with other resins to provide unique solutions to the most difficult needs.

This publication contains information regarding the typical properties of Eastman™ elastomers, as well as suggestions for equipment selection and processing conditions to provide optimal performance.

Eastman's Technical Service group is available to assist you during the design and production phases of your application. Our technically trained staff can help you shorten development and commercialization cycles — critical to maintaining a competitive edge. Call us to see how we can help.

General information

Applications

Eastman™ elastomers may be processed by injection molding, extrusion and extrusion blow molding. As shown in Table 1, all three formulas may be injection molded and extruded into film and tubing, but only Eastman™ AP007 may be extrusion blow molded. Melt temperatures generally range from 205° to 260°C (400° to 500°F). Optimization of melt temperature for a given process is desirable because the range varies from process to process.

Regulatory information

- **European Inventory of Existing Chemical Substances (EINECS)**
  The monomers and reactants used for the production of Eastman™ elastomers are included in the European Inventory of Existing Chemical Substances.

- **FDA status**
  There is no FDA regulation permitting the use of Eastman™ elastomer in either direct or indirect food additives.

Melt characteristics

Eastman™ elastomer has a low melt strength and is extremely tacky during processing. Avoid the use of highly polished chromeplated rolls, molds and other contact surfaces. Otherwise, sticking will be a problem.

Tackiness can be controlled using matte finishes on metal components and by adjusting roll or tooling temperatures. Adjusting the temperature imparts a degree of crystallinity to the product and improves its release properties. In addition, tooling impregnated with Teflon™ fluorocarbon polymer gives good results.

Table 1 **Eastman™ elastomers**

Product	Target inherent viscosity	Extrusion	Injection molding	Extrusion blow molding
AP005	1.05	X	X	
AP006	1.16	X	X	
AP007	1.23	X	X	X

Sealing conditions

Film extruded from Eastman™ elastomer has been sealed to itself by conventional heat-sealing methods such as impulse or radio frequency (RF) sealers in the Technical Service Laboratory. However, conditions used in the laboratory may not translate into suitable conditions for commercial bag manufacturing processes.

Impulse-sealing conditions were determined on a Sentinel Heat Sealer with a 110-volt power source manufactured by Packaging Industries of Hyannis, Massachusetts, U.S.A. The sealing unit (Model Number 24-679, Serial Number 12-12-ASL) utilized voltage or heat on the top and bottom bars. Impulse conditions, as shown in Table 2, yielded a total cycle time of 2.1 seconds.

Test specimens were 0.2 mm (8 mil) thick and 25.4 mm (1 in.) wide. The flat seal width was 2.4 mm (3/32 in.). Specimens were peeled using a Sintech testing machine at a speed of 50.8 mm/min (2 in./min). All specimens were conditioned for 24 hours at 23°C (73°F) and 50% relative humidity (RH) prior to testing. Peak T-peel strengths averaged 1.55 kg/cm (8.7 lb/in.) for 5 specimens.

Conventional RF sealing conditions at 27.12 megahertz (MHz), as typically employed with polyvinyl chloride (PVC) films, cannot be used for Eastman™ elastomer films. The lack of polarity and different dielectric properties necessitates a high RF power level and higher preseal temperature to obtain a satisfactory bond.

A Kabar 10-kilowatt RF sealer operating at 27.12 MHz was equipped with a flat sealing bar or die that was heated to 177°C (350°F). Films were also sealed using a tear-seal die heated to the same temperature. Seal widths were 2.38 mm (0.09 in.) and 1.59 mm (0.06 in.) for flat and tear seals, respectively. Film specimens, conditioning of specimens, and peeling the specimens were the same as outlined above. RF conditions, as shown in Table 2, yielded a total cycle time of 10 seconds.

The flat seal specimens yielded peak T-peel values averaging 1.32 kg/cm (7.4 lb/in.) for 5 specimens. The tear-seal specimens yielded peak T-peel values averaging 1.45 kg/cm (8.1 lb/in.) for 5 specimens.

Table 2 **Sealing conditions for film extruded from Eastman™ AP006**

Impulse sealer	
Film thickness, mm (mil)	0.2 (8)
Cycle time, s	
Seal	1.1
Cooling	1.0
Total	2.1
Power, volts	25
Air pressure, kPa (psi)	413 (60)
Bar RF sealer	
Film thickness, mm (mil)	0.2 (8)
Power level, %	75
Preseal temperature, °C (°F)	177 (350)
Cycle time, s	
Preseal	3
RF seal	6
Cooling	1
Total	10
Air pressure, kPa (psi)	413 (60)

Table 3 Effect of thermal treatment on Eastman™ AP006 film thickness, 0.125 mm (5 mil), % change

	Tensile strength @ break	Tensile modulus	Elongation @ break	Tear strength
ASTM method	D882	D882	D882	D1004
Conditions				
15 min/125°C (257°F)[a]				
M.D.	10	−23	No change	15
T.D.	4	−23	No change	No change
15 min/160°C (320°F)[a]				
M.D.	3	−33	−20	40
T.D.	4	−24	8	−30
Autoclaved[b]				
M.D.	13	−20	6	13
T.D.	4	−10	5	10

[a]*Exposed to temperature shown in forced-air oven.*
[b]*Exposed @ 121°C (250°F) and 0.10 MPa (15 psi) for 1 hour.*

- **Weatherability**
  Eastman™ elastomer polymers are not inherently stable to continuous, long-term exposure to ultraviolet light as encountered in certain outdoor or industrial uses. However, Eastman has formulated and patented a stabilizer package that, when added as a concentrate, greatly enhances weatherability of the material. Testing conducted in accordance with ASTM D1499 in an Atlas® XWR Weather-Ometer indicates time to embrittlement is greater than 3,000 hours. In addition, testing according to ASTM D4329 in a QUV environmental tester indicates time to embrittlement is in excess of 2,100 hours.

General extrusion information

Preparation

The extruder barrel, screw and die should be cleaned thoroughly before running Eastman™ elastomer. Failure to do so will probably result in excessive die lines, gels and other visual defects in the finished product.

Drying

Eastman™ elastomer must be dried to a moisture level of approximately 0.02% before processing, or like other polyesters, it will undergo excessive hydrolytic degradation while in the melt. A dehumidifying desiccant dryer capable of supplying air at 66°C (150°F) with a dew point not exceeding −30°C (−22°F) and an air volume of 0.062 m^3/min/kg (1 cfm/lb) per hour of output will normally dry the material adequately in 4–6 hours. Therefore, the hopper should hold at least 4 times the expected hourly output capacity of the extruder. Longer drying times may be needed if the material has been stored for an extended period.

Drying hoppers, bulk silos, drums and gaylords provide several means for storing polymer resin. Both poured and vibrated bulk densities have been obtained for Eastman™ elastomers. The values are 609 kg/m^3 (38 lb/ft^3) and 673 kg/m^3 (42 lb/ft^3), respectively and may be used for any of the Eastman™ elastomers.

Screw design

Eastman™ elastomer has been shown to process satisfactorily on extruders and screws of a number of different sizes (no special screw design is required to process this material). Extrusion screws having the following characteristics have performed satisfactorily with this material on 63.5-mm (2½-in.) and 88.9-mm (3½-in.) extruders:

- 24:1 minimum L/D ratio
- Approximately the same number of flights in feed and metering sections
- Three or four flight transitions
- Compression ratio of approximately 3:1

If there is a question of suitability of a proposed screw for processing Eastman™ elastomer, it is suggested that a drawing be supplied to Eastman's Technical Service and Development Department in Kingsport, Tennessee, U.S.A., for review.

Filtration

Ordinary screen packs and screen pack changers are normally used for extruding Eastman™ elastomer. For example, a 24/80/180/80/24 mesh arrangement should be suitable. As the micron rating of a screen pack filtration system is reduced, the filter area must be increased to ensure adequate pack life.

Die design

For film extrusion, a die with a flexible lip is suggested. The die should be tapered to minimize the die-to-chill-roll distance. The internal die surfaces should have a 2- to 4-microinch (rms) finish, and the die opening should be 0.6 to 0.8 mm (25 to 30 mil) for film thicknesses of 0.025 to 0.25 mm (1 to 10 mil).

Chill rolls

A preferred casting system requires a special surface finish on the top and bottom rolls that is different from conventional casting roll systems that employ polished chrome finishes. The nature of Eastman™ elastomer melt is such that it vigorously adheres to polished metal finishes. To avoid these problems, the top and bottom rolls should use one of the following finishing methods. The preferred method uses Teflon™-impregnated chrome on the roll surface. There are several trademarked processes that provide this kind of service. The second method employs a 25- to 50-rms finish that may be obtained by sandblasting or vapor honing the roll surface. Both methods yield films with excellent clarity. Although the preferred casting system employs a special finish on the top and bottom rolls, some success has been experienced by using it on the top rolls only.

The quench water temperature to the top roll should be 10°–25°C (50°–75°F) to quench the film, followed by a water temperature of 55°–65°C (130°–150°F) to the bottom roll to promote crystallization. Temperatures as high as 90° to 95°C (190° to 200°F) may be required to promote crystallization at high line speeds. The varying relationships between time and temperature that may be encountered at different throughputs, roll diameters, film thicknesses and temperatures require conditions to be optimized for each particular operation. Sticking on the top roll, even with a special finish, may suggest insufficient cooling or insufficient roll matte, or both. If the film is too tacky, the bottom roll may be too cool. If, on the other hand, the film is milky in appearance, the bottom roll is probably too hot, resulting in excess crystallization.

Auxiliary equipment

The film-casting unit will normally be equipped with air jets to pin the edges of the extrudate to the top roll to prevent excessive neck-in. An air knife is used to provide intimate contact of the extrudate across the top of the chill roll. This ensures uniform cooling and prevents slippage of the film across the roll.

Purging

Polypropylene, high-density polyethylene, and many other materials will do a satisfactory job of purging Eastman™ elastomer. Because of the good melt stability of this material, purging may not be necessary when the machine is shut down. However, material that is not purged will crystallize in the extruder, and elevated temperatures [approximately 14°C (58°F) above normal] will be required on start-up.

Shutdown procedure

Eastman™ elastomer is considered to be heat-stable at the temperatures listed in Table 4. Therefore, the machine can be shut down and later restarted after only a few minutes of purging without any unusual problems. If an extended shutdown is anticipated, it is suggested that the hopper be drained and the extruder run until it is empty. Suitable purging compounds for periodic cleaning of the extruder and die are commercially available.

Table 4 **Suggested conditions for extrusion of 0.125-mm (5-mil) film from Eastman™ AP006**

Material: Eastman™ AP006
Equipment: 60-mm (2.36-in.), 24:1, L/D extruder
Barrier screw
2-Roll stack

Barrel zone	1, °C (°F)	200 (400)
	2, °C (°F)	230 (450)
	3, °C (°F)	260 (500)
	4, °C (°F)	260 (500)
	5, °C (°F)	260 (500)
	6, °C (°F)	260 (500)
Gate, °C (°F)		260 (500)
Screw speed, rpm		17
Water temperature, top roll, °C (°F)		10–25 (50–75)
Water temperature, bottom roll, °C (°F)		55–65 (130–150)
Line speed, mpm (fpm)		9 (30)
Film thickness, mm (mil)		0.125 (5)

Monolayer film extrusion

Table 4 gives suggested conditions for extruding Eastman™ elastomer into monolayer film. Some changes are usually required to optimize film appearance and physical properties. Ordinarily, this material should be extruded at the lowest melt temperature that will yield a satisfactory product.

Multilayer film extrusion

Eastman™ elastomer can be coextruded with other thermoplastic materials having reasonably similar rheological properties and processing temperatures. For example, moisture barrier characteristics can be improved by combining Eastman™ elastomer, any of various suitable tie-layers, and polyolefins or other polymers.

Extrusion blow molding Eastman™ AP007

Drying

See "Drying" on page 5.

Melt temperature

Typical melt temperatures for blow molding Eastman™ elastomer are 205° to 230°C (400° to 445°F). As melt temperature increases, clarity of the molded parts improves. Processing temperatures above 230°C (445°F) can result in excessive parison sag because of reduced melt strength.

Screw design

As discussed in the section on film extrusion, conventional screws have been found to perform satisfactorily with Eastman™ elastomer. Eastman's Technical Service and Development Department in Kingsport, Tennessee, U.S.A., can assist on the suitability of a given design on receipt of a drawing or detailed description of the screw being considered. In most cases, the screw will not require a mixing section. If additional melt homogenization or flow-line removal is required, however, a Maddock, Union Carbide, or similar mixer can be used.

Die head design

The die head may be a PVC torpedo, spider or polyethylene type. Because Eastman™ AP007 is quite viscous under extrusion blow molding conditions, a polyethylene head should have more generous clearances in the restriction areas than those normally associated with polyolefin materials.

Cutoff knife

The cutoff knife is used to cut the hot parison so that the mold can move it away from the die. The cold knife method has been found to provide a reliable cutoff. Sufficient air pressure should be used to provide a rapid swing of the knife.

Mold construction

The mold should be designed to provide good circulation of the cooling water and maximum heat transfer. Aluminum or an alloy of beryllium and copper is the suggested material for the mold. As mentioned previously, Eastman™ elastomer polymer melt vigorously adheres to polished metal surfaces. Mold release may be promoted by using fluoropolymer-impregnated metals, which also promote resistance to friction, wear and abrasion. The finish also prevents entrapment of air. Alternately, a fine matte finish, such as a 220 grit blast, may serve a similar purpose.

All profile changes should be done gradually, and generous draft angles should be provided where possible. This is particularly true for thin cross-sectional parts because an extremely flexible part offers no resistance for pulling free of channels and ledges. Undercut areas must be avoided, and ample venting must be used.

The shrinkage allowance for Eastman™ elastomer will vary with mold temperature and will usually be from 0.004 to 0.008 mm/mm (4 to 8 mil/in.).

Mold temperature

The optimum degree of crystallization is achieved by using molds fabricated from proper metals and by controlling the temperature of the cooling water. Water temperature of 45° to 50°C (110° to 120°F) has been found to provide optimum balance between clarity and crystallization when parts are being blow molded.

External handling devices, such as a picker and blow-pin, must also be controlled to a similar temperature.

Blow-pin

Conventional blow-pins that forge the thread finish or other fitting cannot be used because the hot elastomer will stick to the pin and hold it tenaciously. The blow-pin system must be simply designed to penetrate and seal with minimum surface contact.

Removing part from mold

Because the molded article is soft and flexible, part removal requires special considerations. The following are key items to consider when removing your parts from the mold.

- Parts should be held firmly at two places, usually the top and bottom areas.
- After the mold has been opened, one of the holding devices can serve as a robot, or picker, to carry the molded part away and to release it to a conveyor or other handling system.
- A soft, flexible part does not offer enough rigidity for simple removal and may tend to hang on one side of the mold. Consequently, it is necessary to completely control the location of the part at all times during the removal phase.
- To minimize sticking, all flash areas should be thoroughly air-cooled or completely encapsulated by cooled metal surfaces, such as those on the mold or picker.
- Critical surfaces of the mold and handling device can be coated with Teflon™ fluorocarbon polymer.
- Flash areas can be readily torn or cut free of the molded part if the appropriate pinch lands are built into the mold.
- Automatic in-mold detabbing is difficult or impossible because the tab is needed as a holding part during removal.

Purging

See "Purging" on page 6.

Shutdown

See "Shutdown Procedure" on page 7.

Processing conditions

The suggested extrusion blow molding conditions for a 60-mm (2.36-in.) extruder are given in Table 5. These conditions may need to be adjusted, depending on such factors as screw design, output rate, part design and other variables.

Table 5 **Suggested extrusion blow molding conditions for Eastman™ elastomer AP007**

Equipment: 60-mm (2.36-in.) extruder
Bekum HBV 120 blow molding machine
18-oz Widemouthed jar mold
Single PVK-50 torpedo die
Bushing I.D., mm (in.) 22.87 (0.900)
Mandrel O.D., mm (in.) 22.35 (0.880)

Barrel zone	1, °C (°F)	188 (370)
	2, °C (°F)	221 (430)
	3, °C (°F)	193 (380)
	4, °C (°F)	169 (335)
Gate, °C (°F)		182 (360)
Die body, °C (°F)		182 (360)
Die tip, %		80
Melt temperature, °C (°F)		216 (421)
Mold coolant temperature, °C (°F)		38 (100)
Screw speed, rpm		24
Blowing time, s		12.0
Overall cycle, s[a]		17

[a]*Double shuttle run in single-shuttle mode.*

Injection molding Eastman™ elastomer

Drying

See "Drying" on page 5.

Melt temperature

Eastman™ elastomer can be molded with melt temperatures ranging from 225° to 260°C (435° to 500°F). At low melt temperatures, the material flows relatively easily into the mold. At high melt temperatures, the material flows so easily that flashing is generally a problem in any area where the mold is not seated tightly. For molding most items, temperatures in the range of 230° to 250°C (450° to 480°F) are desirable.

Mold temperature

Mold temperature is usually critical to the production of acceptable parts from Eastman™ elastomer. Mold temperatures ranging from 5° to 80°C (40° to 180°F) have been used. Mold temperatures in the range of 50° to 80°C (120° to 180°F) allow some crystallization of the polymer to occur, resulting in easier ejection from the mold. Better surface finish and shorter cycles result from these higher mold temperatures, although parts appear hazier as a result of polymer crystallization. Mold temperatures on the low end of the range tend to result in severe sticking of parts in the mold unless cooling and overall cycle times are increased. For the most part, temperatures in the range of 40° to 65°C (100° to 150°F) are suggested, with the higher temperatures preferable when sticking on cores or in cavities and sprue bushings is evident.

Injection pressure

Low injection pressures are usually preferable because Eastman™ elastomer flows easily and tends to flash. High pressures tend to reduce mold shrinkage by compressing the rubbery material. Sticking in the mold and on the sprue bushing and cores can result from overpacking with high injection pressures.

Injection speed

Part thickness and design generally dictate the injection speed to be used. Medium to slow injection speeds are generally preferred when molding Eastman™ elastomer. Fast speeds tend to overpack and cause sticking and flashing. Also, jetting and backfilling can occur with fast injection speeds, resulting in surface defects.

Screw design

General-purpose screws having compression ratios of 2.5–3.0 to 1 have been used successfully. The transition zones should have a gradual transition (typically 4-6 diameters) so that the high shear heating of rapid transition is avoided. It is suggested that a free-flowing sliding check ring nonreturn valve at the end of the screw be used instead of a ball check type valve. Vented barrels are not recommended. Unfilled resins are generally mild on screw wear, and corrosion of the barrel and screw is not expected with these copolyesters.

Screw speed

Screw speed does not appear to be critical to the successful processing of Eastman™ elastomer. Screw speeds of 30 to 120 rpm have been used successfully.

Back pressure

Back pressure is not normally required when molding natural Eastman™ elastomer. If, however, large reground particles are present in the feed or if color concentrates or dry coloring agents are being used, it may be necessary to use a small amount of back pressure to keep the screw full, to plasticate the material properly, and to aid in color dispersion. If back pressure is too high, screw return time may be significantly increased or feeding problems may result.

Venting

Eastman™ elastomer gives off little or no gas during molding, and vents of 0.01 to 0.02 mm (0.0004 to 0.0008 in.) are usually adequate to release air entrapped in the mold. In accordance with good mold design, vents should be relieved to the edge of the mold.

Sprues, runners and gates

Sprue and runner systems should be as short as possible to minimize pressure drop. The sprue should be large enough in diameter so that it will not freeze before the runner system.

Gates should be as large as practical. It is suggested that gates be at least 1.3 mm (0.05 in.) in diameter for Eastman™ elastomer, but a smaller gate should be satisfactory for small, thin-walled parts. Web or tab gates should be considered for large parts. Sprue gating is acceptable for single-cavity molds, but care should be taken in operation not to overpack the cavity.

Radii and fillets

All materials are sensitive to notches to some degree. Whenever possible, sharp corners or angles should be rounded to produce parts more resistant to tearing when they are ejected from the mold or subjected to rigorous end-use conditions.

Part ejection

The rubbery nature of Eastman™ elastomer, along with its tendency to adhere to polished metal surfaces, means that it is often difficult to eject parts from the mold. Sufficient draft and knockout pins, larger than those used with conventional plastics, are usually required. Besides being larger, more knockout pins may be necessary. Ejection of parts has also been enhanced through the use of Teflon™-impregnated nickel, a finish that provides good wear and lubricity. When special tooling finishes do not exist, mold releases of the spray type can be used to aid ejection in prototype work. Also, internal mold releases such as zinc stearate or Acrawax C at a level of 0.3% to 1% have been found to help part ejection considerably.

Purging

See “Purging” on page 6.

Shutdown and start-up

If the molding machine is purged, normal shutdown procedures should be used. The screw should be moved to its forward position, and the machine operated as an extruder until no more plastic is being extruded. The heat can then be turned off and the screw stopped.

When processing is to be started again, the heater should be turned on and allowed to heat the machine to operating temperature. Then the injection switch should be actuated, even though the screw is already in a forward position. The small motion that results will free the slip ring of the nonreturn valve so that it will operate properly. Rotation of the screw can then begin.

Typical physical properties

Measurements on all Eastman™ elastomer formulas have not demonstrated any significant differences. Eastman™ AP006 has been selected as the material of choice in generating data. Typical physical properties of Eastman™ elastomer are reported in Tables 6 through 11 and Figure 1. Additional information may be obtained by contacting Eastman at one of the addresses on the back cover of this brochure.

Table 6 **Mechanical properties of Eastman™ AP006**

Property,[a] units	ASTM method	Typical value
Specific gravity	D792	1.13
Durometer hardness, shore D/A scale	D2240	55/95
Tensile stress @ break	D412[b]	22 (3,200)
Tensile stress @ yield	D638[c]	14 (2,030)
Elongation @ yield, %	D638[c]	38
Elongation @ break, %	D638[c]	400
Tensile modulus, MPa (psi)	D638	170 (24,650)
Flexural modulus, MPa (psi)	D790	150 (21,750)
Tear strength, N (lbf)	D1004	350 (79)
Izod impact strength, notched, J/m (ft·lbf/in.) @ −40°C (−40°F)	D256	40 (0.75)
Torsional modulus temperature, °C (°F) @ 240 MPa (35,000 psi)	D1043	−28 (−18)
@ 930 MPa (135,000 psi)		<-70 (<-94)
Water absorption, 24h, %	D570	0.4

[a] *Unless noted otherwise, all tests are run @ 23°C (73°F) and 50% RH.*
[b] *D412, Die C specimens, which are equivalent to ASTM D638, Type IV specimens. Specimens were 2.0 mm (0.075 in.) thick and were tested using a crosshead speed of 500 mm (20 in.) per min.*
[c] *Injection molded ASTM D638 type I specimens, about 3 mm (1⁄8 in.) thick, were tested using a crosshead speed of 508 mm (20.0 in.) per min.*

Properties reported here are typical of average lots. Eastman makes no representation that the material in any particular shipment will conform exactly to the values given.

Table 7 Physical properties of film extruded from Eastman™ AP006

Property,[a] units	ASTM method	Typical value
Thickness, mm (mil)		
Minimum		0.11 (4.5)
Maximum		0.14 (5.5)
Haze, %	D1003	1
Gloss at 45°	D2457	85
Transmittance, %	D1003	
Regular		94
Total		93
Refractive index, n_D	D542	1.51
Tensile stress @ yield, crosshead speed, 500 mm (20 in.)/min, MPa (psi)	D882	
M.D.		14 (2,030)
T.D.		12 (1,740)
Elongation @ break, %	D882	
M.D.		>400
T.D.		>500
Tensile modulus of elasticity, crosshead speed, 25 mm (1 in.)/min, MPa (psi)	D882	180 (26,000)
Coefficient of friction	D1894	>1.0

[a]*Unless noted otherwise, all tests are run @ 23°C (73°F) and 50% RH.*

Properties reported here are typical of average lots. Eastman makes no representation that the material in any particular shipment will conform exactly to the values given.

Table 8 Electrical properties of film extruded from Eastman™ AP006

Property,[a] units	ASTM method	Typical value
Arc resistance, s (tungsten electrodes)	D495	Fails by melting
Comparative tracking index (CTI), volts	IEC112	Fails by melting
Volume resistivity (in air), ohm·cm	D257	10^{14}
Surface resistivity, ohm/square	D257	10^{15}
Dielectric strength, short time test @ 500 volts/s rate of rise, kV/mm (V/mil)	D149	14 (356) in oil 6 (152) in air
Dielectric constant	D150	
1 kHz		3.9
10 kHz		3.8
1 MHz		3.7
Dissipation factor	D150	
1 kHz		0.02
10 kHz		0.02
1 MHz		0.02

[a]*All tests are run @ 23°C (73°F) and 50% RH.*

Table 9 Permeability properties of Eastman™ AP006

Property,[a] units	ASTM method	Typical value
Specimen thickness, mm (mil)		0.11–0.14 (4.5–5.5)
Water vapor transmission rate @ 38°C (100°F) and 90% RH, $g/m^2 \cdot 24h$ ($g/100\ in.^2 \cdot 24h$)	F372[b]	190 (12)
Gas permeability $cm^3 \cdot mm/m^2 \cdot 24h \cdot atm$ ($cm^3 \cdot mil/100\ in.^2 \cdot 24h \cdot atm$)	D1434	
CO_2 @ 23°C (73°F)		>1,000 (>2,540)
O_2 @ 30°C (86°F)		130 (330)

[a]*Unless noted otherwise, all tests are run @ 23°C (73°F) and 50% RH.*
[b]*Mocon values; confirmed by ASTM E96E.*

Properties reported in Tables 8 and 9 are typical of average lots. Eastman makes no representation that the material in any particular shipment will conform exactly to the values given.

Figure 1
Rheological properties of Eastman™ elastomer AP006

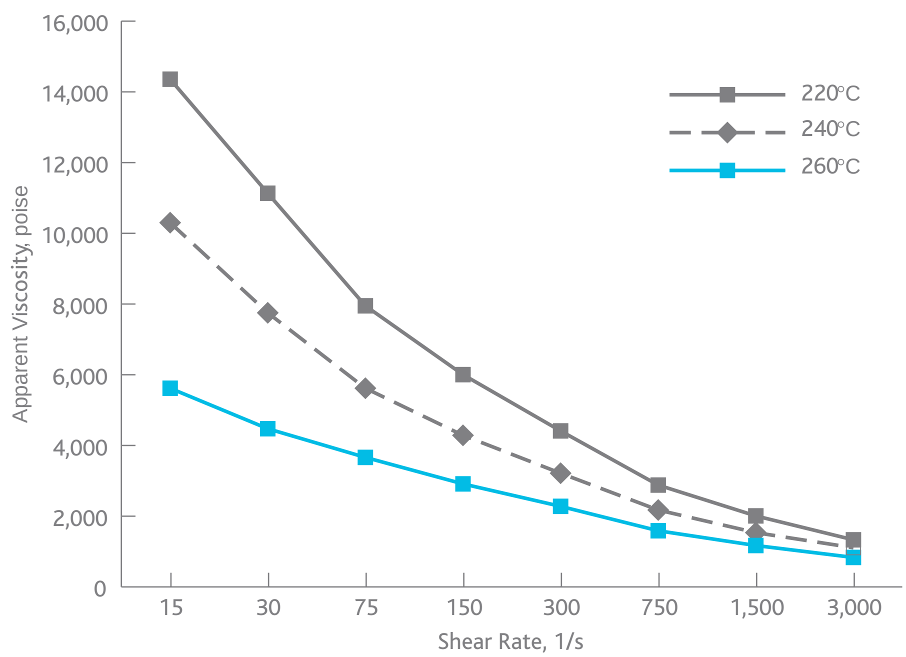

Table 10 **Thermal properties of Eastman™ elastomer AP006**

Property,[a] units	ASTM method	Typical value
Flow rate (condition 230°C/2.16 kg load), g/10 min	D1238	10
Crystalline peak melting point, T_m, °C (°F)	D3418	205 (400)
Crystallization temperature on cooling, T_{cc}, °C (°F)	DSC	140 (284)
Glass transition temperature, T_g, °C (°F)		−3 (27)
Specific heat,[b] kJ/kg·K (cal/g·°C) 25°C (77°F)—solid		1.6 (0.382)
100°C (212°F)—solid		1.8 (0.430)
150°C (302°F)—solid		2.0 (0.478)
175°C (347°F)—solid		2.3 (0.549)
200°C (392°F)—transition		3.1 (0.740)[c]
225°C (437°F)—melt		2.3 (0.549)
Heat of fusion, kJ/kg (Btu/lb)	E793	27 (11.6)
Thermal conductivity, W/m·K (cal/cm·s·°C) 31°C (88°F)	C177	0.19 (0.0004)
Coefficient of linear thermal expansion, 10^5 mm/mm·°C (10^5 in./in.·°F)	D696	15 (8)
Brittleness temperature, °C (°F)	D746	<−75 (<−103)
Vicat softening temperature (1 kg load), °C (°F)	D1525	170 (338)

[a]*Unless noted otherwise, all tests are run @ 23°C (73°F) and 50% RH.*
[b]*Specific heat in Btu/lb·°F is numerically equivalent to the value in cal/g·°C.*
[c]*Apparent specific heat, including the effects of the heat of fusion.*

Properties reported here are typical of average lots. Eastman makes no representation that the material in any particular shipment will conform exactly to the values given.

Table 11 **Chemical resistance of Eastman™ elastomer AP006**

Chemical	Effect[a]
Acetic acid	Severe swelling
Acetone	Severe swelling
Benzyl alcohol	Dissolved
γ-Butyrolactone	Swollen
Cyclohexanone	Severe swelling
1,2-Dichloroethane	Dissolved
Ethanol	Slight swelling
Ethanol, 50%	No effect
Ethyl acetate	Severe swelling
Ethylene glycol	No effect
Ethylene glycol monomethyl ether	Slight swelling
Gasoline	Swollen
Heptane	Slight swelling
Hydraulic fluid	No effect
Isopropanol	Slight swelling
Lipid solution, 20%	No effect
Methanol	Slight swelling
Methyl ethyl ketone	Slight swelling
Methyl isobutyl carbinol	Slight swelling
Methyl isobutyl ketone	Severe swelling
Motor oil	No effect
Nitromethane	Swollen
Sodium hydroxide, 10%	No effect
Sodium hypochlorite bleach, 5%	No effect
Sulfuric acid, 20%	No effect
Tetrahydrofuran	Severe swelling
Toluene	Swollen
Transmission fluid	No effect
Water	No effect

[a]*Visual appearance after 4-week immersion @ 23°C (73°F).*

Conversions of metric/U.S. customary values may have been rounded off and therefore may not be exact conversions.

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WA-132 6/09
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