EASTMAN

Adhesives and sealants raw materials

GPC molecular weight determinations of Eastoflex™ amorphous polyolefins

Eastoflex™ amorphous polyolefins (APOs) are characteristically saturated, low molecular weight (MW), propylene-based olefin polymers. These products are inherently soft, tacky, and flexible, having broad compatibility with numerous elastomers, polymers, and tackifying resins. This makes them useful for a variety of applications, such as components in adhesive and sealant formulations and as paper laminating adhesives. Their good flexibility and hydrophobic nature make them useful as waterproofing compounds for wire and cable applications as well as asphalt modifiers for modified bitumen roll roofing products.

Eastoflex APOs are typically characterized by properties such as viscosity, softening point, needle penetration, glass transition temperature, and tensile strength. Customers often inquire about the molecular weight (MW) of these products. MW determinations of several Eastoflex APOs were obtained by gel permeation (size exclusion) (GPC).

The weight-average molecular weight (M_w), number-average molecular weight (M_n), and polydispersity index (M_w/M_n) were obtained on a Waters 150C GPC using a refractive index detector and 1,000-, 10,000- and 500-Ångstrom HT columns. The GPC was calibrated with low-Mw polyethylene standards, thus the values are relative and cannot be quantitatively compared to other Mw determinations.

The following types of APOs were submitted for MW determination: propylene homopolymer, propylene-ethylene copolymers, and homopolymer/propylene ethylene copolymer blends (mixtures). See Table 1 for MW determinations and polydispersity indices. Mw ranged from about 9,500 to 29,000 and Mn from about 2,900 to 9,100, with Mw/Mn ranging from 3.24 to 4.21. In general, MW increases with viscosity.

Table 1 **Molecular weight determinations of Eastoflex™ amorphous polyolefins (APOs)**[a]

Formula	Comonomer(s)	Target viscosity @ 190°C, cP	Wt avg mol wt (M_w)	No avg mol wt (M_n)	Polydispersity index (M_w/M_n)
P1010	—	1,000	14,000	3,700	3.78
P1023	—	2,250	19,600	5,400	3.63
E1003	Ethylene	250	9,500	2,900	3.28
E2030	Ethylene	3,100	18,600	4,800	3.88
E1060	Ethylene	6,000	23,300	6,600	3.53
E1200	Ethylene	20,000	28,700	9,100	3.15
M1010	Mixture	1,000	15,100	4,000	3.78
M1018	Mixture	1,750	17,300	5,200	3.33
M1030	Mixture	2,900	18,300	5,000	3.66
M1058	Mixture	5,800	17,500	5,400	3.24

[a]*The weight-average molecular weight (M_w), number-average molecular weight (M_n), and polydispersity index (M_w/M_n) were obtained on a Waters 150C GPC that was calibrated with low-MW polyethylene standards. Thus, the values are relative and cannot be quantitatively compared to other molecular weight determinations.*

Figure 1 **MW distributions of amorphous polypropylene homopolymers**

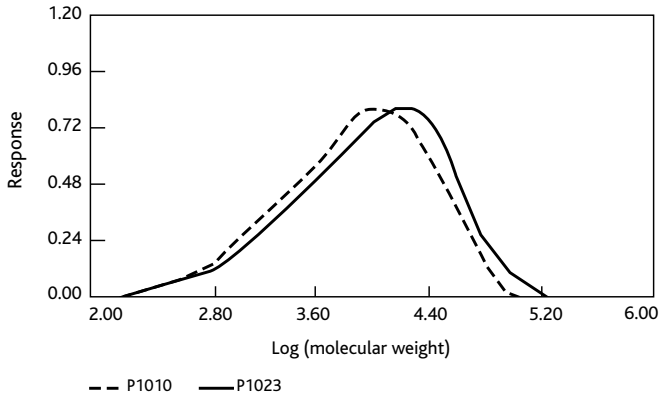


Figure 2 **MW distributions of amorphous propylene-ethylene copolymers**

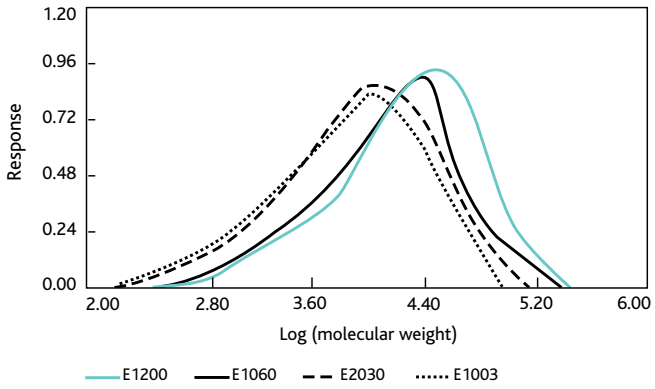
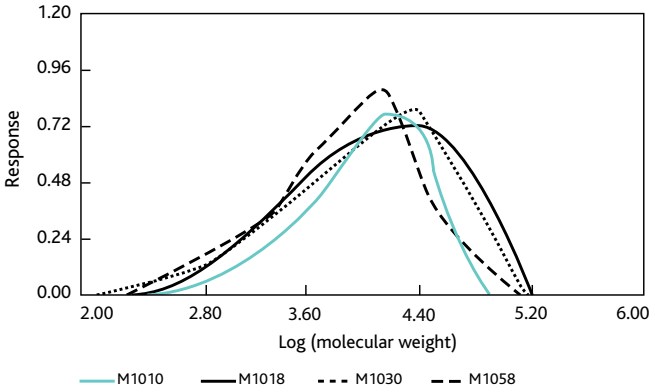


Figure 3 **MW distributions of amorphous polyolefin mixtures**



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