CALPRENE 540 | 700 | 743

SBS grades for injection shoe molding

Elastic compounds for injected applications is a difficult challenge for SBS. Typically, the high styrene content improves the transparency, but sacrifices other mechanical properties such as elongation, tensile strength, and others.

Dynasol has developed three polymers in order to find a balance in molecular weight and styrene/butadiene composition. Calprene 700, Calprene 540 and Calprene 743 are linear SBS compounds with a structure shown in figure 1.

Figure 1 - Thermoplastic Linear SBS

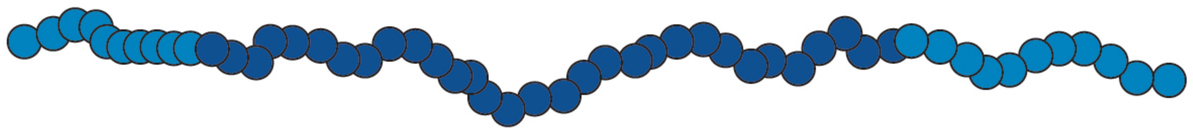


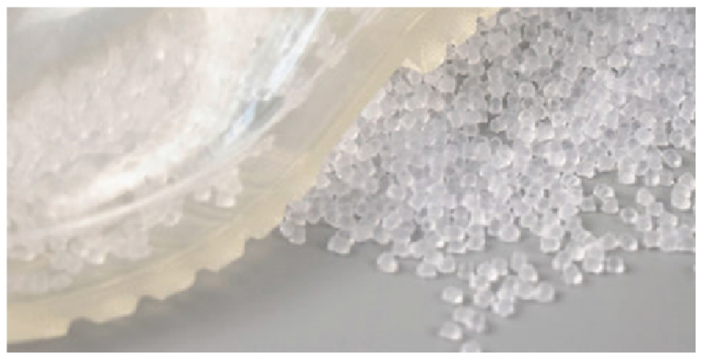
Table 1 represents the main polymer property among other polymers. The study was done by keeping the same formulation for transparent shoe soles (see figure 2) produced by the injection molding process. This is after the compounding is formulated by the extrusion method.

The main properties of these three elastomers used in shoe formulations are shown in table 1.

Table 1 - Elastomer Properties

PROPERTY	Calprene 700	Calprene 540	Calprene 743
Total styrene, % by weight	30	40	43
Block polystyrene, % by weight	30	40	43
Melt Flow Index at 190°C and 5Kg, g/10min	5.0	5.5	23.0
Volatile Material, % by weight	0.5	0.5	0.5
Insoluble content, % by weight	0.1	0.1	0.1
Ash, %	0.35	0.35	0.35

Figure 2 - Transparent Mold Injected Sole



The formulations used in this study are shown in table 2. Ingredients were mixed by extrusion using a twin screw extruder brand Werner & Pfliederer, L/D=20, using an extruding profile starting at 65°C at the feeding zone and finishing with 180°C at the die zone.

Table 2 - SBS Extrusion

Ingredient	Formula 1	Formula 2	Formula 3
Calprene 500	69	-	-
Calprene 540	-	69	-
Calprene 743	-	-	69
Paralux 1001 (paraffinic oil)	30	30	30
Antioxidant (Irganox 1010)	1	1	1

These compounds were injected in order to obtain different specimens for properties of Hardness Shore A (DIN 53505), Melt Flow Index (MFI under ASTM D1238), Abrasion (DIN 53516) and Density (DIN 53479). The results are shown in table 3.

Table 3 - Compound Hardness

Properties	Formula 1	Formula 2	Formula 3
Hardness Shore A	45	90	52
Density, g/cm3	0.927	0.936	0.940
Abrasion (DIN 53516), mm3	135	111	109
MFI at 190°C/5Kg, g/10 minutes	42	70	180

Follow us!

Dynasolgroup

dynasolgroup.com
marketing.dynasol@dynasol.com

Dynasol Group Houston

14340 Torrey Chase Blvd Suite #365
Houston, TX 77014
Phone: (281)-874-0888
Toll Free: 1 877-559-7568
Fax: (281) 885-1742

Dynasol Group Madrid

Titán 15, 9th Floor
28046 Madrid, Spain
Phone: (34) 900 103 239
Fax: (34) 913 238 352

Figure 3 shows the response of hardness shore A due to the composition and characteristics of each SBS polymer compared in this study. The styrene content plays a strong role in this study.

Figure 3 - Hardness Response

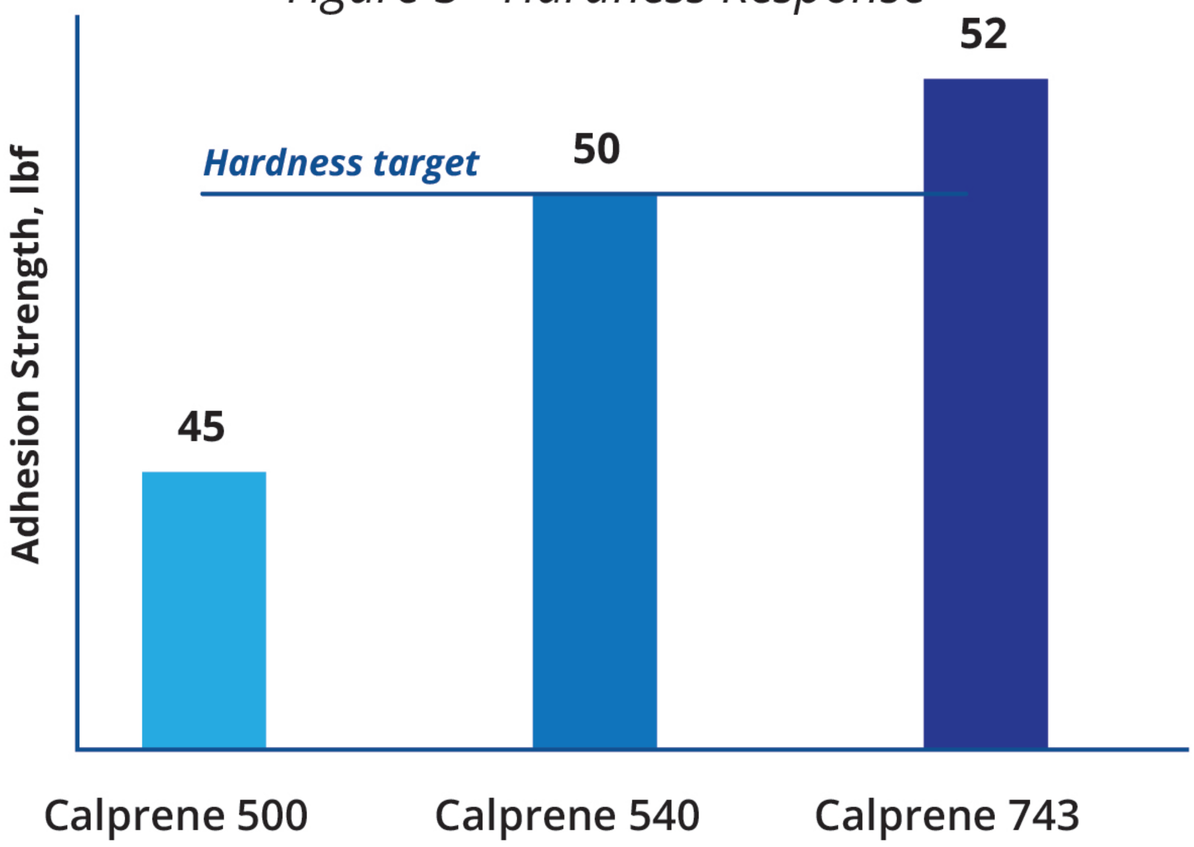


Figure 4 shows that these three SBS polymers permit to get transparent shoe soles with low abrasion.

Figure 4 - Polymer Abrasion

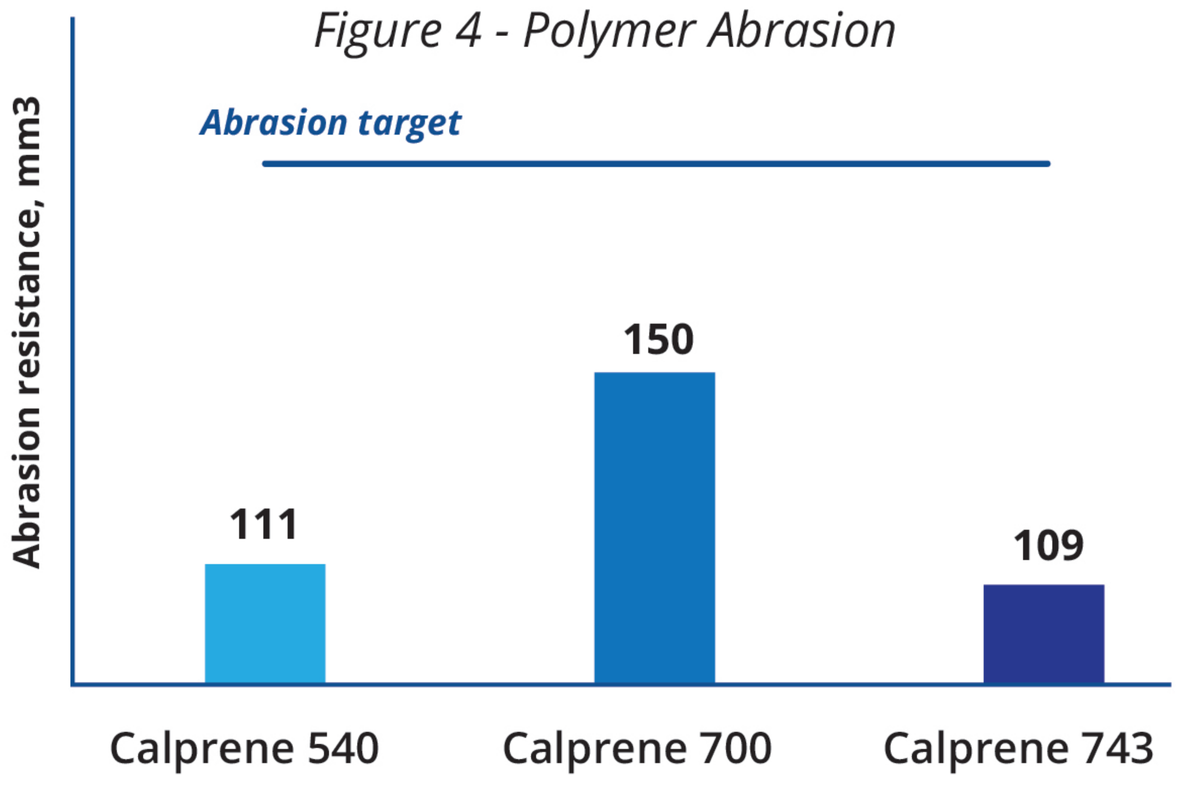


Figure 5 shows the influence of high styrene content and original MFI from SBS. Both parameters have a strong influence in the final flow of the compound. Calprene 743 promotes the higher melt flow index in the compound without sacrificing hardness. This may also be approached in non-transparent shoe sole in combination with other polymers.

Figure 5 - Influence Of High Styrene Content And Original MFI From SBS

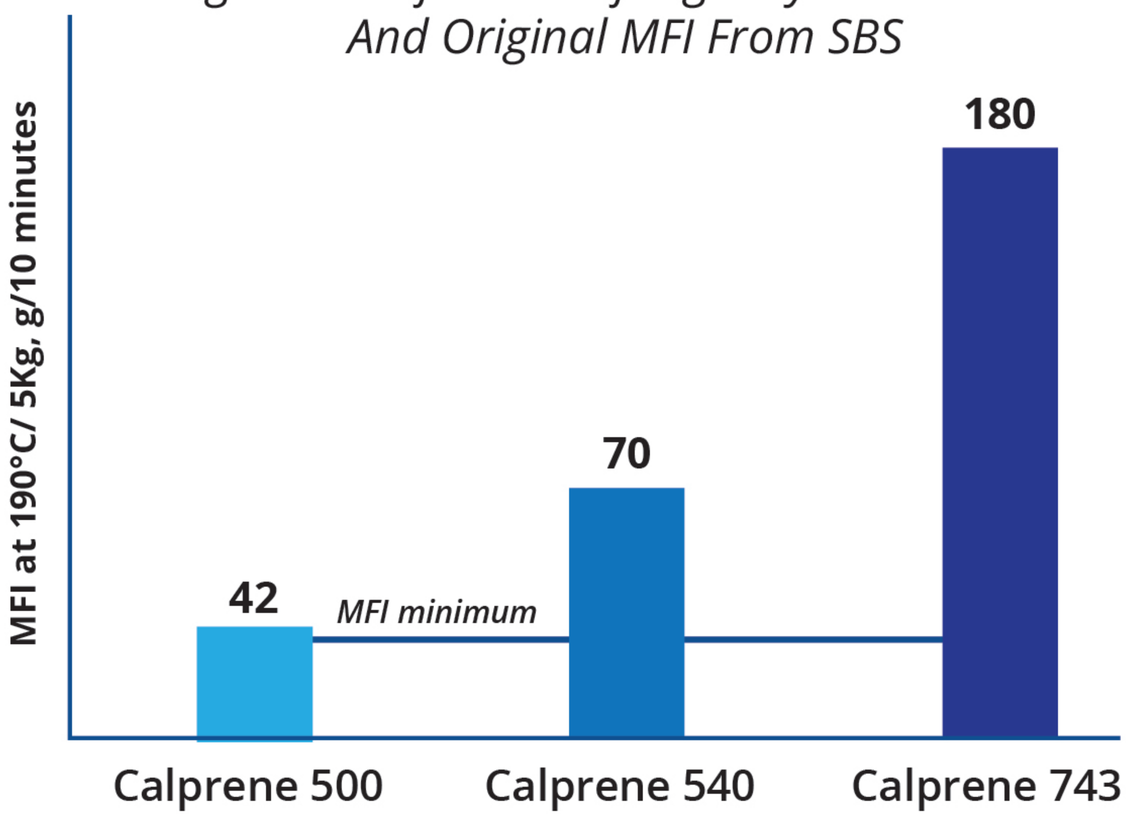
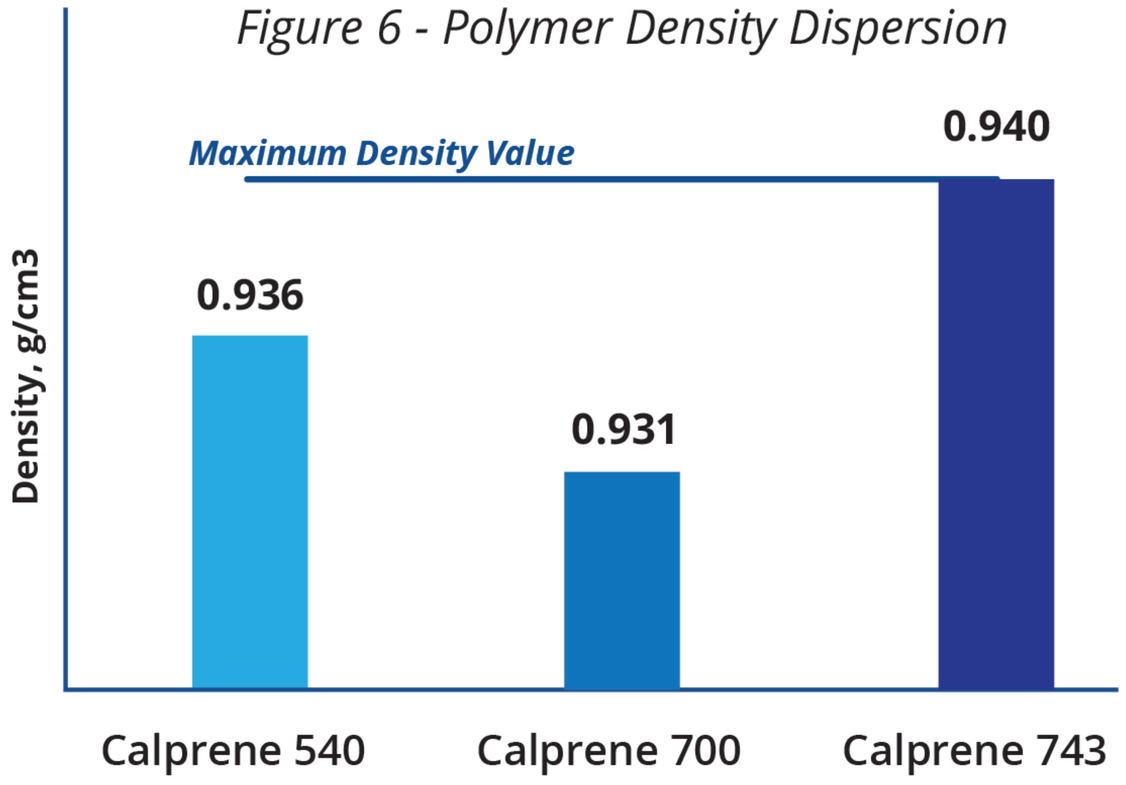


Figure 6 shows the influence of each polymer in the density of transparent shoe compound. Due to the high flow of Calprene 743 all ingredients dispersed and compacted better increasing the density.

Figure 6 - Polymer Density Dispersion



SUMMARY OF RESULTS

Dynasol group has three SBS polymers for transparent shoe soles: Calprene 500, Calprene 540 and Calprene 743. Depending on the flow of compound it will be the selection of the polymer. For those formulations with low hardness, Calprene 500 will be a good choice.

For those formulations where hardness Shore A should be high, both Calprene 540 and Calprene 743 are a great choice. For those formulations which requires high hardness and high melt flow index, Calprene 743 could be an option. Also, when shoe design includes many runners and all cavities may be filled, the high Melt Flow Index from Calprene 743 may help.