Rubber
FOOTWEAR

Precipitated Silica for High-Performance Footwear Rubber Reinforcement

During World War II, supplies of natural rubber to the U.S. were cut off, forcing many companies to seek out new raw material solutions for their rubber-based products. Footwear manufacturers, whose industry was among the most greatly affected, responded to the shortage by reinforcing shoe soles with carbon black.

When the U.S. Navy began to complain that carbon-black soles were leaving dark marks on their ship decks and housewives began to see the same damage to their living room floors, an enterprising rubber company turned to PPG for an answer.

Together, they combined a new synthetic elastomer with SILENE™ precipitated silica, a product that PPG had developed primarily for the tire industry. The result was more than a new leather-like-sole with improved wear resistance that didn't leave scuffs on floors; it also marked the beginning of PPG's leadership in engineering advanced reinforcing silica products for the footwear industry.

Today, that same spirit of innovation drives the development of HI-SIL® and CIPTANE™ non-black reinforcing fillers from PPG. Available in a variety of grades, this diverse set of precipitated silica grades enables high-performance footwear formulators to produce colored or translucent non-marking soles with superior durability and resilience, along with improved compounding stiffness and modulus for enhanced flexibility and comfort.

Other benefits of *Hi-Sil*, *Ciptane* and *Silene* reinforcing silica products for footwear include:

- Good color and transparency for translucent soling
- Enhanced abrasion resistance in colored heels and soles
- Better flex/crack growth resistance and hot-tear resistance

Recommended Silica for Footwear

Typical Properties

N_2

Silica Grades	(BET-5) Surface Area (m^2/g)	pH	Residual Salt Type	Physical Form	Reinforcement
***Silene* 732D**	33	8.5	Na_2SO_4	Powder	Semi-Reinforcing
***Hi-Sil* 532EP**	55	8	Na_2SO_4	Powder	Semi-Reinforcing
***Hi-Sil* 233**	135	7	NaCl	Powder	Reinforcing
***Hi-Sil* 210**	135	7	NaCl	Pellet	Reinforcing
***Hi-Sil* 243LD**	135	7	NaCl	Granule	Reinforcing
***Hi-Sil* 233-D**	151	7	Na_2SO_4	Powder, Granule	Reinforcing
***Ciptane* LP**	N/A	7	Na_2SO_4	Sphere	2.5% MPTS
***Hi-Sil* 255G**	N/A	6.3	Na_2SO_4	Powder, Granule	High

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