

zeopol[®] huberpol[™]

HIGH DISPERSION SILICAS (HDS)



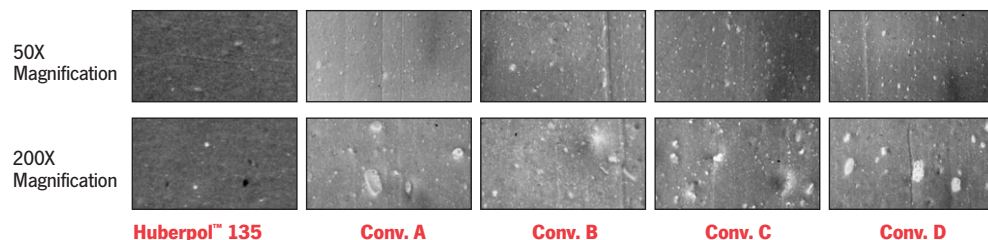
Depth and Understanding: Huber's line of reinforcing silicas that easily disperse like non-reinforcing fillers. Improve mixing, processing, and consistency of rubber properties. Low dusting, granulated products that disperse as well as dustier powdered silicas. And with the Huberpol line, cost is comparable to your current silicas. Improve quality and reduce factory problems without a cost penalty.

WHAT ARE THEY?

Zeopol[®], Huber's product tradename for its patented silica process, is a highly dispersible form of precipitated amorphous silicon dioxide (SiO₂). The HDS product achieves **outstanding dispersion** in rubber compounds due to several enhancements to standard silica products. 1) Traditional silica agglomerates resist breakdown to smaller particles. Zeopols[®] and Huberpols[™] are reduced to less than 1 micron in size during typical rubber mixing. Most competitive "easy dispersing" silicas do not achieve this small particle size. 2) Higher structure on the particle surface produces more interaction with the polymer. 3) A higher activity surface (more hydroxyl groups) also interacts more readily with the polymer (particularly the Zeopol[®] 8715). The Zeopol[®] silicas will not only produce higher, more consistent physicals with easier processing but they can also be a problem solver for the molded goods compounder.

The newest innovation from Huber is an HDS general purpose silica tradenamed **Huberpol[™] 135**. Huberpol[™] 135 reinforces like standard silicas (**better** than standard silica if coupling agents are used) but has **outstanding** dispersion. No more excessive milling to disperse the "little white specks". Stress points caused by poor dispersion are minimized. Critical dispersion products like printing blankets and rolls can use silicas for maximum reinforcement without battling dispersion problems. A nitrile roll compound with 45 phr of silica was mixed under identical conditions with Huberpol[™] 135 and four competitive silicas of comparable surface area. The magnified (50x and 200x) sliced surfaces are shown below. The vast improvement in dispersion is clearly evident. Remarkably, Huberpol[™] 135 is cost competitive with standard silicas.

HUBERPOL[™] 135 DISPERSION COMPARISONS IN NITRILE ROLL COMPOUND



PRODUCT	PHYSICAL FORM	pH	SURFACE AREA (CTAB m ² /gm)	SURFACE AREA (BET m ² /gm)
Zeopol [®] 8715	Granule	6.8	90	163
Zeopol [®] 8745	Granule	7.0	140	186
Zeopol [®] 8755	Granule	6.9	153	195
Huberpol [™] 131	Powder	7.0	135	150
Huberpol [™] 135	Granule	7.0	135	150

zeopol[®]
huberpol[™]

HIGH DISPERSION SILICAS (HDS)

c o n t i n u e d

WHY USE THEM?

OUTSTANDING PHYSICAL PROPERTIES:

Superior properties like tensile, tear and abrasion resistance result when compared to conventional silicas of equal surface area. To obtain these higher performance properties with normal silicas, a compounder would have to pay the penalty of higher surface area resulting in higher viscosity and difficult mixing. Zeopols[®] mix easier and develop a lower compound viscosity while improving physical properties (typically 10% higher). See the Table I graph of tensiles resulting from the replacement of N234 carbon black with high dispersing silicas as well as two competitive silicas. The HDS silicas come close to matching the high reinforcement of N234. Perhaps even more important than the slightly improved physicals are the more consistent physical properties. Factory-mixed, traditional silica formulas tend to have scattered tensile and tear properties due to dispersion variation. The excellent dispersion of HDS silicas will result in **consistency of physical properties**. Another bonus is the small particle size also means transparency of shoe soles, toys, etc. can be improved.

BETTER PROCESSIBILITY:

Lower viscosities vs. standard silicas (as well as other competitive HDS products) result in improved milling behavior, mold flow, extrusion, and calendaring. Typical silica boardiness is significantly reduced. Better dispersion eliminates the excessive milling to get all the "white specks" out that normally exist when silica mixing. Batch-to-batch uniformity is improved.

IMPROVED DYNAMIC PROPERTIES:

Improved flex fatigue and lower hysteresis values (when a silane coupling agent is added) result from the better dispersed silica. "Green" tire manufacturers have found silane-coupled Zeopol[®] to **better** carbon black for heat buildup (as measured by tan delta) while abrasion is comparable. The Zeopols[®] have the added advantage of requiring less silane than standard silica due to the reactive surface chemistry. Zeopol[®] 8715 requires just **half** the normal silane coupler, representing a significant cost savings.

HOT TEAR IMPROVEMENT:

There are many molded goods that have undercuts that result in torn parts when demolding. Traditional silica has always been one tool to reduce this problem. Sometimes low loadings of silica help; more often the hot tear is still inadequate and the silica loading must be increased. Uncured and cured properties change. The Zeopol[®] HDS silicas dramatically improve hot tear in most formulas even when used at lower loadings (i.e. 10 phr). Impact on processibility and finished properties is minimized.

IMPROVED ADHESION PROPERTIES:

Many industrial rubber products have to be bonded to metal inserts or fabric backing. The extremely active surface chemistry of Zeopol[®] 8715 promotes improved bonding to most substrates. Not only is the bond strength better, but when rubber tear is achieved in the bond, the higher tear strength provided by the HDS products makes for higher final adhesion values.

FILLERS
/ EXTENDERS

WHY USE THEM? (continued)

LOW DUSTING FORM:

The Zeopol[®] and Huberpol[™] silicas are provided in a low dusting, granular form. With normal silica the compounder must pay a penalty in poorer dispersion when a low-dusting, granulated or compressed silica is used. HDS Silicas are exactly the opposite: low dusting with **improved** dispersion. A powdered version of Huberpol[™] is available now for the ultimate dispersion product.

COST:

The Zeopol[®] silicas are slightly higher in cost than standard silicas. However, most reinforcing silicas tend to be used in higher quality, higher cost compounds. Zeopol[®] High Dispersing Silicas raise the quality of silica-loaded compounds at a small price increase. Considering the high value returned with Zeopol[®] use, the extra cost is actually quite small. Improved consistency and processing with higher physicals will pay back the minor cost differential. Other cost savings that are harder to document may include lower mixing costs (less energy need be input), less uncured scrap and rework, and fewer part defects. If you need a standard silica's properties **and** cost but would like the improved dispersion offered by Huber's technology, the Huberpol[™] line is the silica to use. The Huberpols[™] are similar in cost to the standard silicas. Huberpol[™] 131 and 135 will drop into your current silica specification(s).

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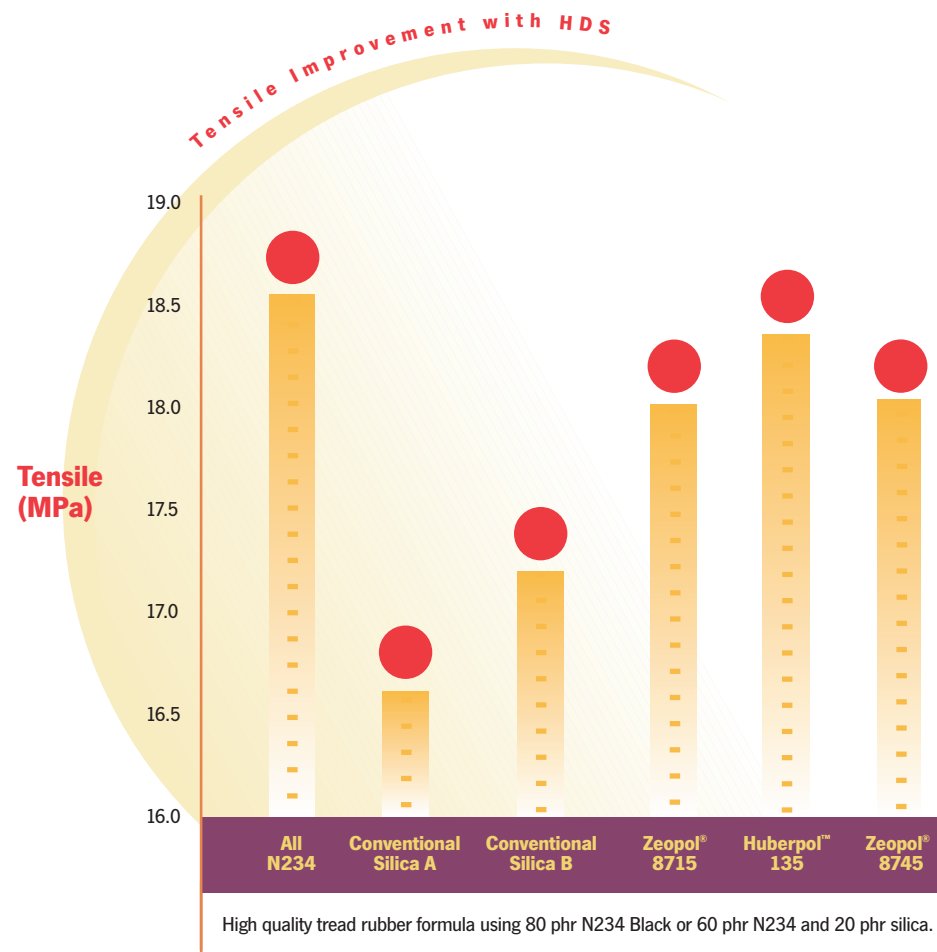


TABLE 1