

## Vulkasil® N

Specialty and Standard Chemicals

### Function

Vulkasil® N is a silica filler with a reinforcing effect.

### Product description

Composition: precipitated silica  
 Appearance: white amorphous powder  
 Density (at 20 °C): approximately 2.0 g/cm<sup>3</sup>  
 Ignition loss: approximately 4.0 % (referred to dry substance)

| <u>Property</u>                        | <u>Nominal value</u> | <u>Unit</u>       | <u>Test method</u> |
|--|----------------------|-------------------|--------------------|
| Volatile matter (2 h at 105 °C)        | 5.5 ± 1.5            | %                 | DIN ISO 787/2      |
| pH value (5 % in water)                | 6.9 ± 0.6            | ---               | DIN ISO 787/9      |
| Specific surface area (BET)            | 130 ± 20             | m <sup>2</sup> /g | ISO 9277           |
| Electrical conductivity (4 % in water) | ≤ 1000               | µS/cm             | DIN ISO 787/14     |
| Sieve residue (0.063 mm)               | ≤ 0.1                | %                 | DIN ISO 787/18     |

### Use

Mode of action: Vulkasil® N is able to interact not only with products of low molecular weight, e.g. water or compounding ingredients like accelerators, but also to some extent with itself and the polymer. If the filler-filler interaction can be reduced, the viscosity of the compound falls correspondingly. So if substances that are adsorbed by the filler more readily than the rubber are added to the compound, the viscosity is reduced and the compound becomes easier to process.

Additives of this kind include basic accelerators such as DPG (Vulkacit® D); compounds containing hydroxyl groups, such as glycols; and almost all compounds containing basic nitrogen, e.g. triethanolamine, dicyclohexylamine etc.

Because most of these additives not only facilitate processing but reduce the accelerator adsorption or have accelerating effects themselves, they are often termed "activators". LANXESS supply a range of such activators under the trade name Rhenofit® as well as processing promoters under the trade name Aflux® and Aktiplast®.

The amount of activators needed with Vulkasil® N is considerably higher than with Vulkasil® C or Vulkasil® A 1. If the usual mercapto or sulfenamide accelerators are employed, it is generally sufficient to add 6 - 10 phr of a glycol or 2.5 - 5 phr Vulkacit D.

Silanes are also suitable filler activators for Vulkasil® N. They take part in a chemical reaction with the silanol groups of the silica filler. This "hydrophobizing" effect influences the filler-filler interaction. Processing is facilitated so much that fairly large quantities of Vulkasil® N can be incorporated.

Processing: Vulkasil® N can be mixed into the rubber in an internal mixer or on a two-roll mill. As Vulkasil® N is a highly active filler with a large specific surface area sometimes it is not easy to incorporate it into rubber compounds, particularly where large quantities are concerned.

**Vulcanizate Properties:** As a highly reinforcing filler, Vulkasil® N gives harder vulcanizates with higher tensile strength, tear strength and abrasion resistance values than non-reinforcing (inactive) fillers like whiting, soft china clay, talcum etc. at comparable loadings. The aforementioned filler activators facilitate processing and activate the cure considerably. They improve the mechanical properties of the vulcanizates. Without activators, the properties are entirely unsatisfactory, i.e. very low modulus values, low tensile strength and high abrasion.

The mechanical properties of goods containing silica fillers differ in several characteristic ways from those of goods containing carbon black: comparatively high hardness values occur together with relatively low modulus values. The strength is improved. The level of abrasion resistance obtained with highly reinforcing carbon black is not quite reached. The hot air resistance of vulcanizates with silica fillers is often better than with carbon blacks.

Under dynamic deformation, vulcanizates containing Vulkasil® N have higher complex moduli but lower loss factors than corresponding vulcanizates containing carbon black. This is exploited in the formulation of tire tread compounds, where precipitated silica / carbon black blends are used with appropriate silane activation to provide tires with reduced rolling resistance and improved skid performance.

Vulcanizates with Vulkasil® N differ very little in mechanical properties from those with Vulkasil® S. Vulkasil® N tends to give less reinforcement, but this depends on the compound formulation.

**Dosage:** Vulkasil® N can be used in large quantities of up to 100 phr, depending on the type of rubber, activator and properties desired in the final product.

**Application:** Vulkasil® N is a suitable filler for all rubbers except silicone rubber. It is used particularly for hard, light-colored, colored or transparent articles, such as soles and heels, tubing, profiles, bicycle tires, car and bicycle inner tubes, cable sheathing and for any technical rubber goods that need particularly good mechanical properties in order to withstand the service conditions. The use of this highly reinforcing silica filler is not restricted to light-colored goods. Apart from being used in conjunction with china clay, siliceous chalk and other inactive fillers to reduce costs and improve processability, Vulkasil N is often blended with carbon black in the manufacture of such goods as conveyor belts and tires.

Blends of Vulkasil N and larger proportions of carbon black are used in truck tire treads, where they improve the tear resistance.

## Packaging

20 kg paper bag on 780 kg skid.

## Storage stability

In original closed packaging under cool (approximately 25 °C) and dry conditions 730 days from date of production.

## Handling

For additional handling information on Vulkasil® N please consult current safety data sheet.

These raw material properties are typical and, unless specifically indicated otherwise, are not to be considered as delivery specification.

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