

PROMAXON[®] in

Friction Applications

Introduction

Since asbestos is on the list of suspect products, a lot of research has been done for asbestos-replacement in friction. A perfect replacement product does not yet exist. Solutions are to be found in combinations of several products.

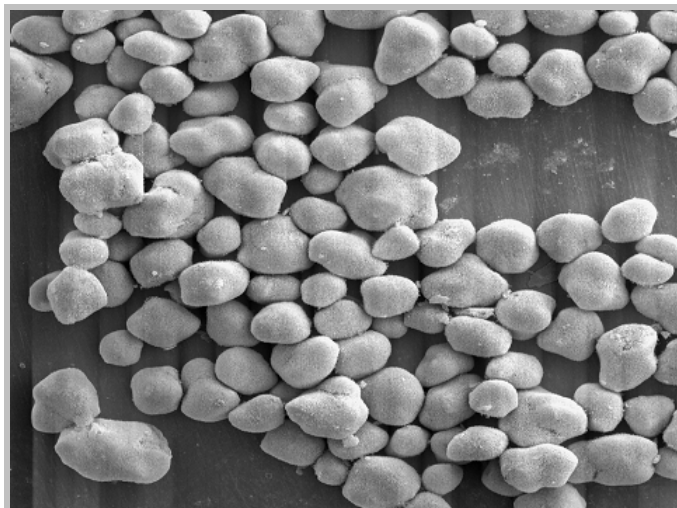
PROMAXON[®] is one of them.

Product Description

PROMAXON[®] is a synthetic hydrated calcium silicate. By means of a special crystallisation process and controlled crystal growth, particles are produced with a more or less spherical morphology. The result is an open inner structure surrounded by an outer shell of close knitted needle-like crystals.

The chemical structure of PROMAXON[®] corresponds with the known mineral Xonotlite $\text{Ca}_6\text{Si}_6\text{O}_{17}(\text{OH})_2$.

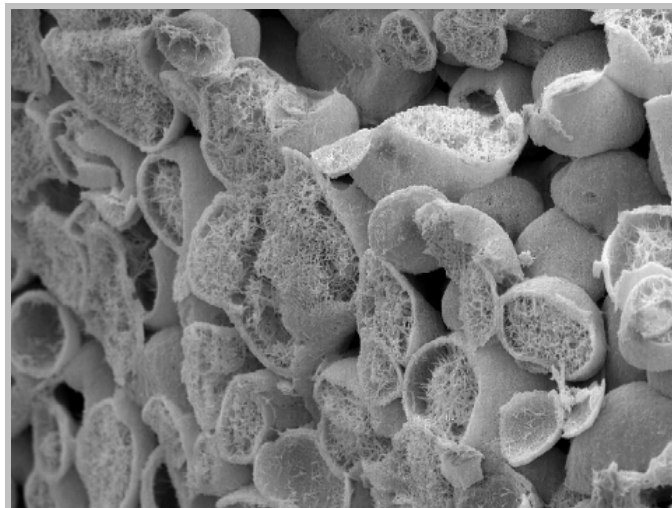
PROMAXON[®] is a white powder with an open inner structure surrounded by an outer shell of close knitted needle-like crystals



Properties

Promat reserves the right to modify without previous announcement the values for the properties of all its products. The technical data of this datasheet correspond to the state of technology and were obtained in specific conditions. All details have been described to the best of our knowledge. The user should verify whether he/she disposes of the latest version. The user is responsible for an appropriate and correct use of the products [14/01/97](#)

Bulk density (g/l)	85 - 130
Average particle size (µm)	35 - 85
Coarse particles (> 254 µm)	< 2 %
Moisture content	< 3 %
Loss on ignition	< 7 %
Specific weight (g/cm ³)	± 2.6
Specific surface area (BET m ² /g)	> 40
pH-value	9 - 10
Chemical analysis	
SiO ₂	± 50 %
CaO	± 43 %
Al ₂ O ₃	± 0,3 %
MgO	± 0,4 %
Fe ₂ O ₃	± 0,3 %
Oil absorption (g/100g)	± 300



Thermal Gravimetric Analysis.

- perfect stability up to 620°C ; no decomposition within the working temperature of automotive friction materials.
- dehydration between 620 and 750°C.
- above 750°C , loss of chemically bound water, but no significant morphological changes will occur till 1200°C.

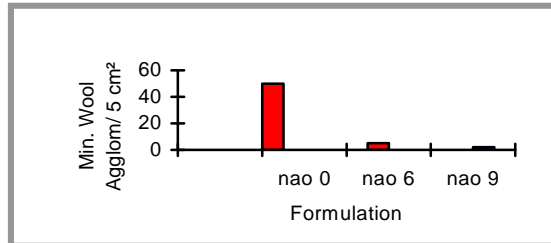
PROMAXON as a mixing aid.

During mixing and depending on the formula and the shearforces applied, some of the **PROMAXON**[®] D-particles will break into individual crystals, acting as short fibers. The unbroken particles will provide porosity and permeability.

Interaction with other ingredients

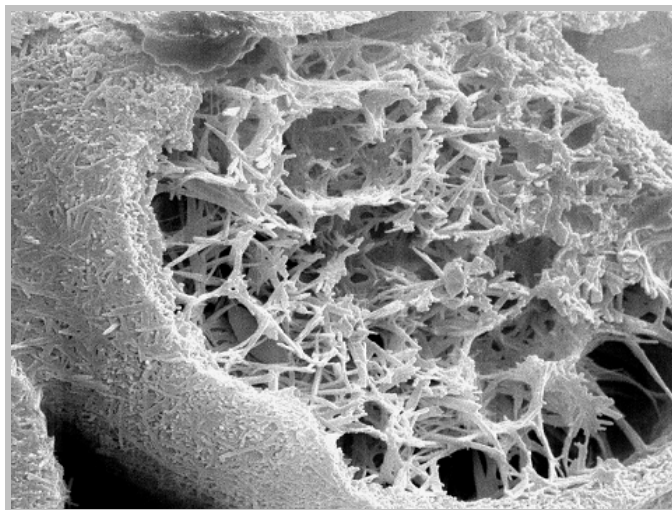
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- **PROMAXON®** provokes better opening of the fibers;
- **PROMAXON®** reduces mixing times considerably due to an improved dispersion of all ingredients;
- **PROMAXON®** results in an anti-segregation effect as well for mineral wool as for aramid fibers; (and thus improves their efficiency) The same observations are notified with aramid fibers;



nao 0 , nao 6 , nao 9 being a non-asbestos organic formulation with respectively 0, 6 and 9 % **PROMAXON® D.**

- **PROMAXON®** neutralises electrostatic charges between fibers;
- excellent mechanical bonding of **PROMAXON®** crystals to the surface of the reinforcing fibers, hereby highering wetting of fibers by resins and improving thus fiber-matrix adhesion.



Preforming and curing

- addition of 6 and 9% of **PROMAXON®** gives a better preform with higher green strength and good edge stability; the result is a fine “cosmetic” product
- a higher open porosity, bigger pores and improved permeability enables dissipation of the gases during pressing, press curing and heat treatment;
- less cracking at the surface and inside the molded pieces means less quality-rejects and bigger savings.

Mechanical Performances

- a substantial lower density is obtained without negative influence on the mechanical performances;

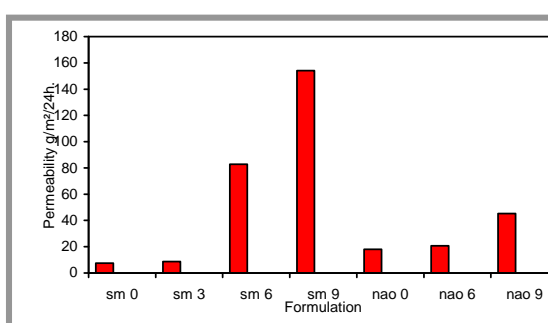
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- a substantial lower difference between E-moduli at low and high temperatures is observed;
- **PROMAXON®** used in flexible friction products with rubber matrix reinforces the whole product improving bending strength.

Physical Performances.

- porosity measurements have shown a significant increase of the mean pore radius for increasing amounts of **PROMAXON®** especially in semi-metallic formulations.
- increase of connected pores improves permeability and enables easier gas-evacuation from the friction interface and thus increases apparent friction coefficient.

Permeability tests according to ASTM E 96:



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Frictional Performances

- Several typical sm and nao -formulations were compounded with addition of 0 to 9 % **PROMAXON®**
- in general **PROMAXON®** contributes significantly to stabilizing the friction level with respect to temperature changes; Krauss test results are available upon request.
- Besides less fading, better recovery a more comfortable noise-level is recorded.

Health and Safety Aspects.

PROMAXON® has no harmful chemical elements in its composition. Investigations by the P. & M. Curie University in Paris have demonstrated the non-chemical toxicity for this product.

Animal experiments conducted by Fraunhofer Institute of Toxicology in Hannover (final report of 1993) have shown that **PROMAXON®** is a material extremely soluble in a living body. Introduced in the rats lung, more than 99 % of single crystals and about 90 % of the agglomerates of crystals are eliminated already two days after instillation. The remaining particles have an extremely short life time.