



PERCO /30M and Perox /30M
new Fluoroelastomer compounds
containing low friction
nano-composites based on PTFE



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PERCO /30M and Perox /30M new compounds with nano-composites

Market requirements:



Low permeability
Good abrasion resistance



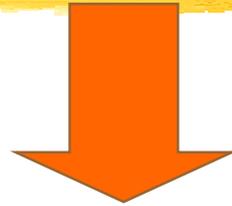
High hardness and
high elongation



FDA compliant
No metal ions



PERCO /30M and Perox /30M new compounds
with nano-composites



Development of a
new class of peroxide curable FKM compounds based on

- 1) **nano-PTFE** at different concentrations
- 2) two levels of fluorine content
PERCO: medium Fluorine
PEROX : high fluorine
- 3) Shore A hardness from 65 to 90
- 4) several colours



Modified nano-PTFE synthesis

Polymerization

Microemulsion System

$$N_p(\mu E) \gg N_p(E)$$

$10^{18} \gg 10^{16}$

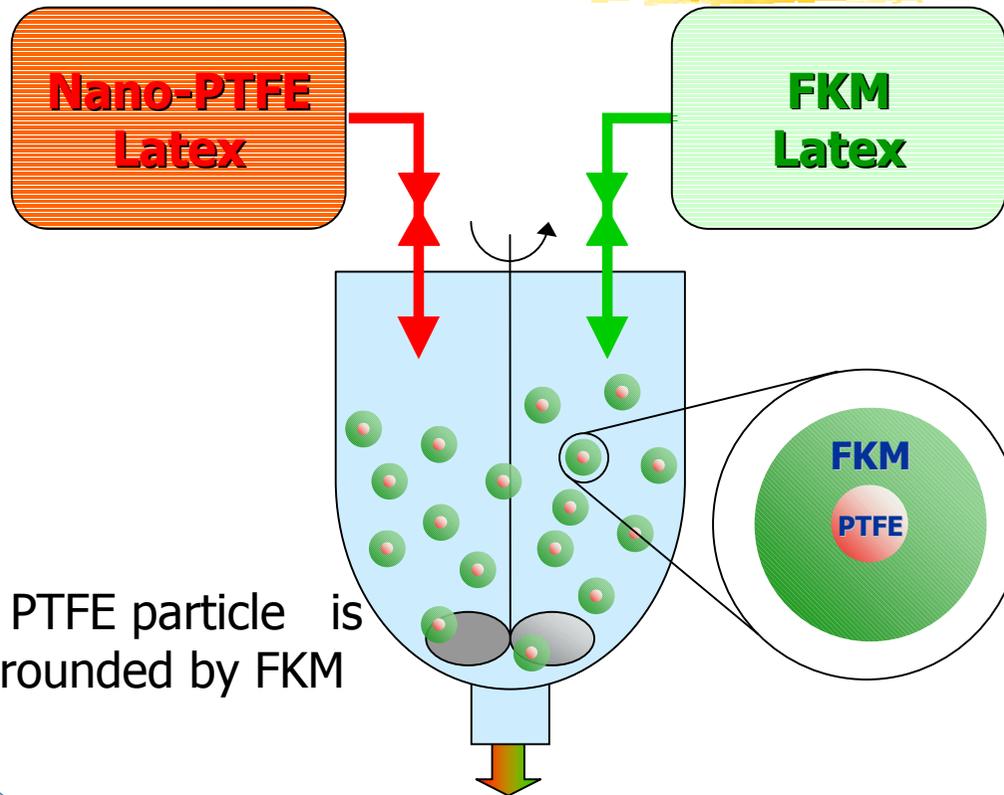
[particles/l]



The microemulsion is transparent because the particle size is lower than the light wavelength

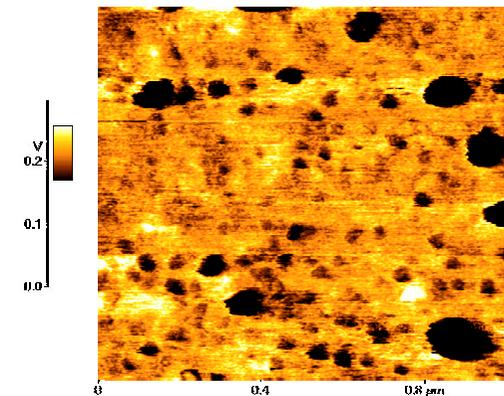
The FKM polymer is obtained via a Co-coagulum approach

Polymerization



The PTFE particle is surrounded by FKM

Phase



D_p (blend) = 40-50nm



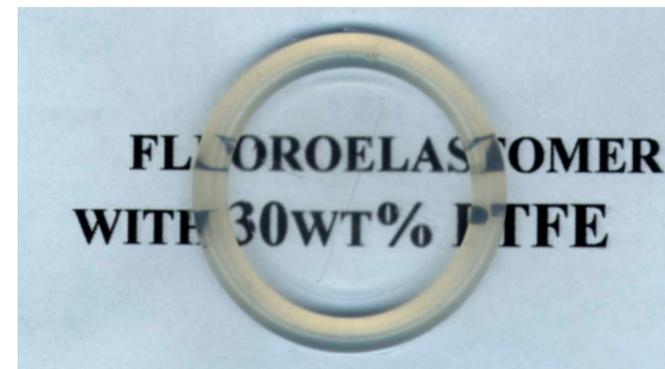
The Nano-composite structure allows the production of transparent items

Polymerization



Uncured material
with different nano-PTFE
loadings

Oven post Cured o-ring
containing 30%wt PTFE

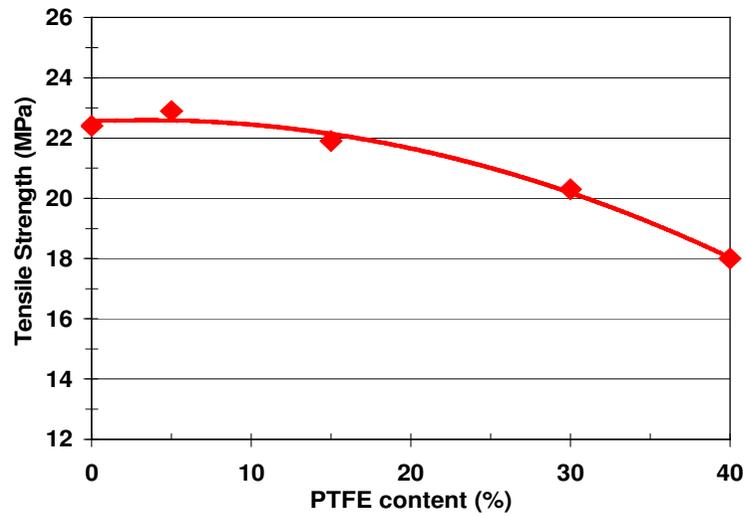


Effect of nano-PTFE content

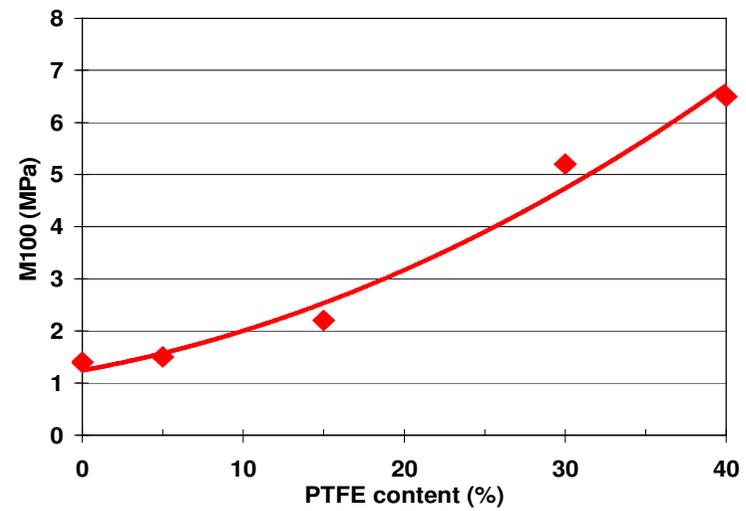
Mechanical Properties

Compound Properties

Tensile Strength



Modulus @ 100% Elongation

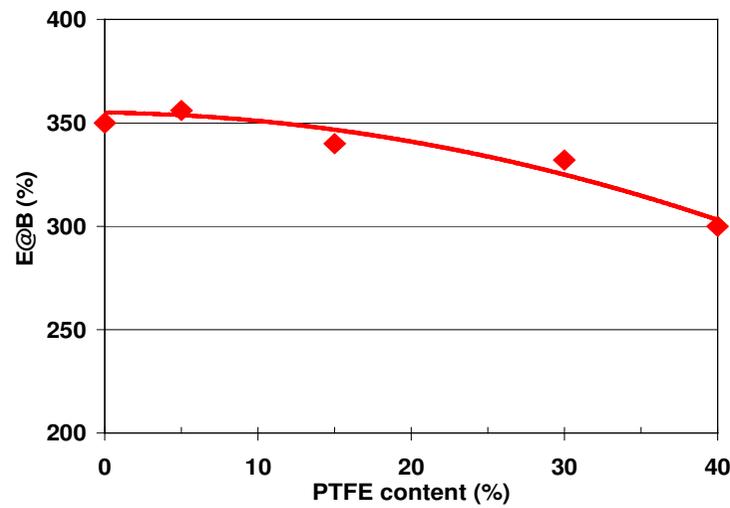


Effect of nano-PTFE content

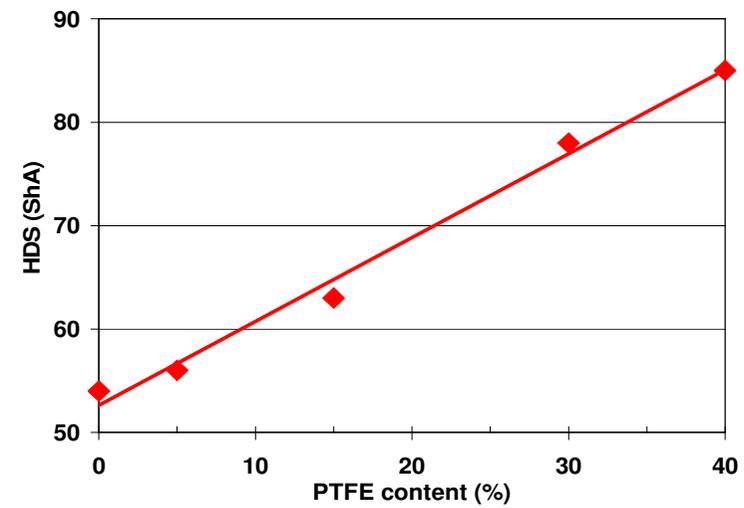
Mechanical Properties

Compound Properties

Elongation @ Break



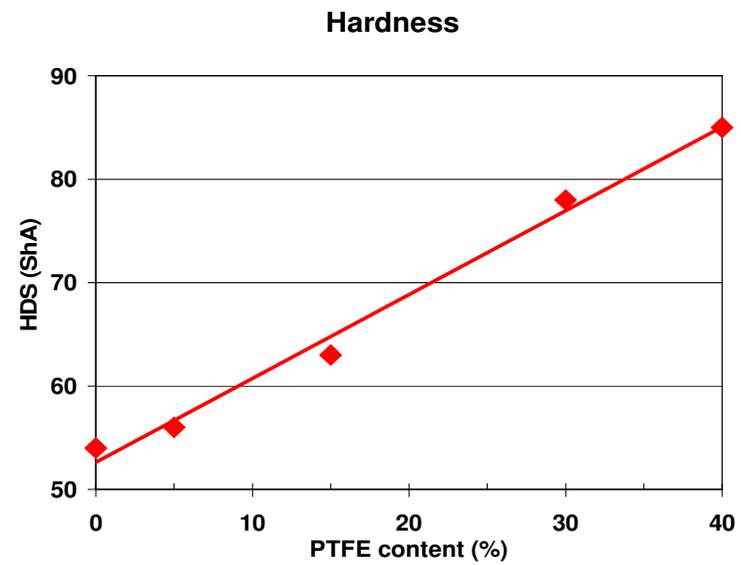
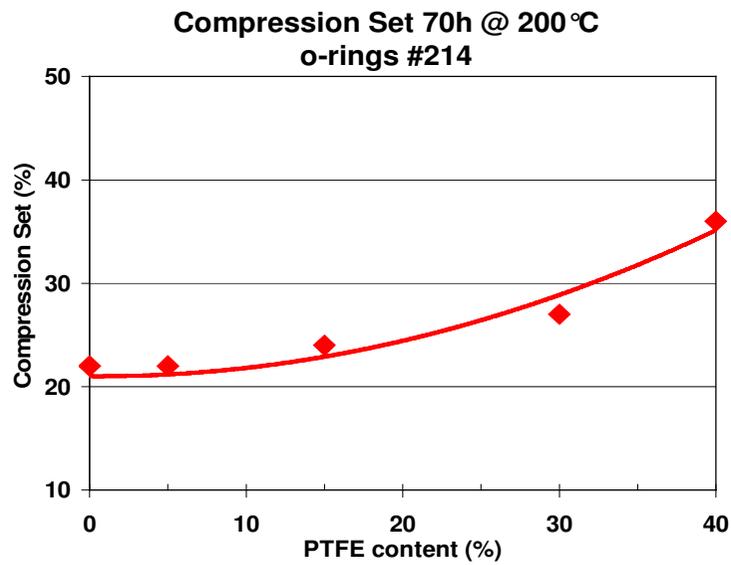
Hardness



Effect of nano-PTFE content

Mechanical Properties

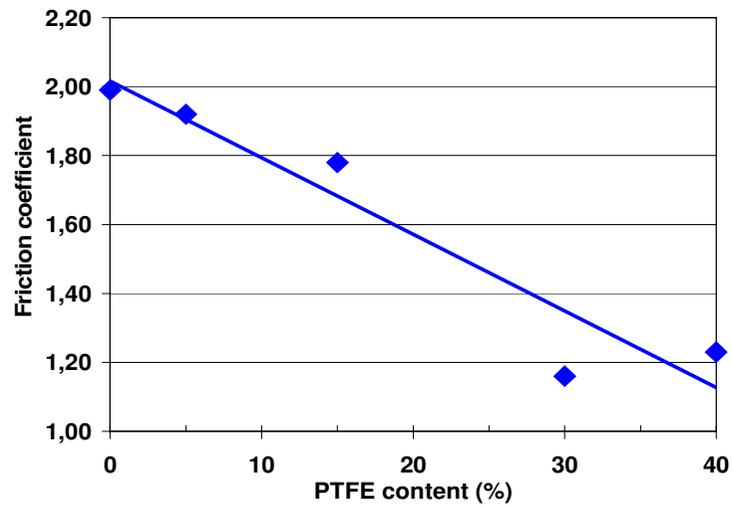
Compound Properties



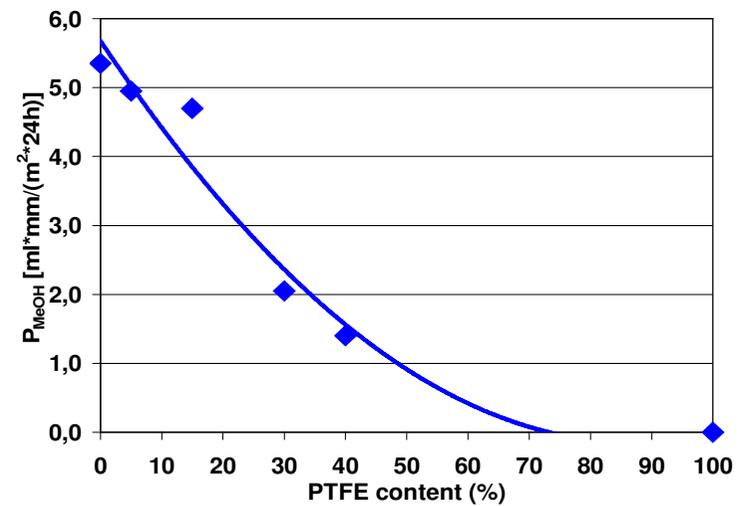
Effect of nano-PTFE content

Physical and Chemical Properties

Friction coefficient



Permeability in MeOH



Effect of nano-PTFE content

Mechanical Properties

nano-PTFE	%wt	40	30	15	5	0
<i>Mold press 10min @ 160°C</i>		<i>Post Cure (1+4)h @ 230°C</i>				
Tensile Strength	MPa	18,0	20,3	21,9	22,9	22,4
M100	MPa	6,5	5,2	2,2	1,5	1,4
Elongation @ Break	MPa	300	332	340	356	350
Hardness	MPa	85	78	64	56	54
C.Set 70h @ 200°C o-rings #214	%	36	27	24	22	22



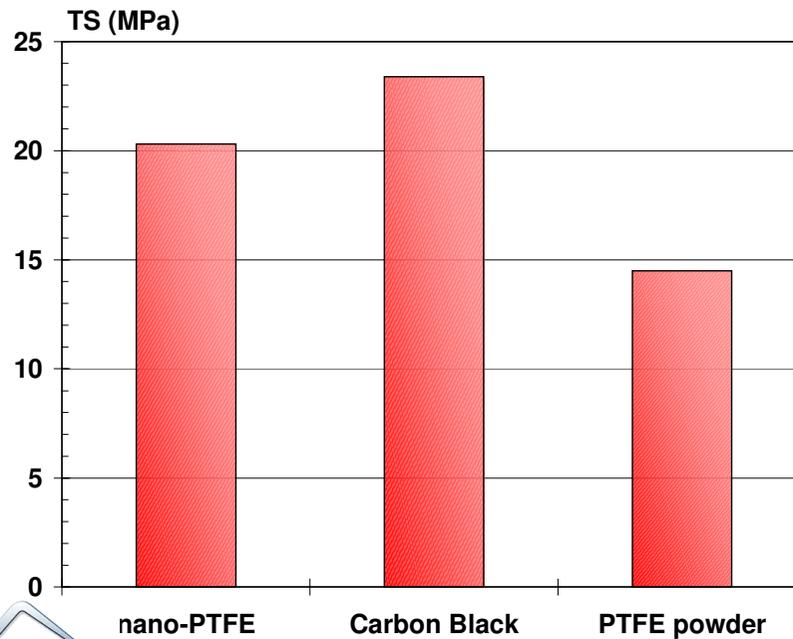
Effect of filler type

Mechanical Properties

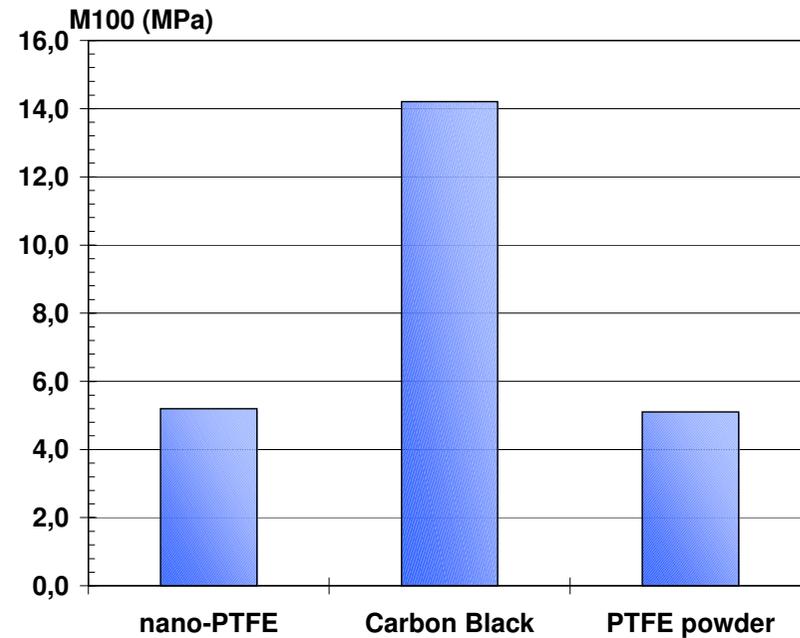
Filler content: 30%wt

Compound Properties

Tensile Strength



Modulus @ 100% Elongation



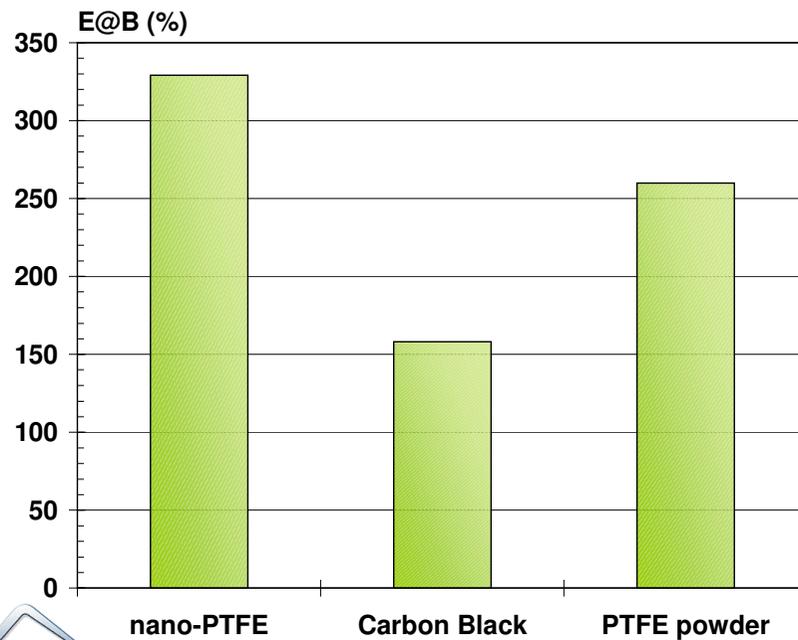
Effect of filler type

Mechanical Properties

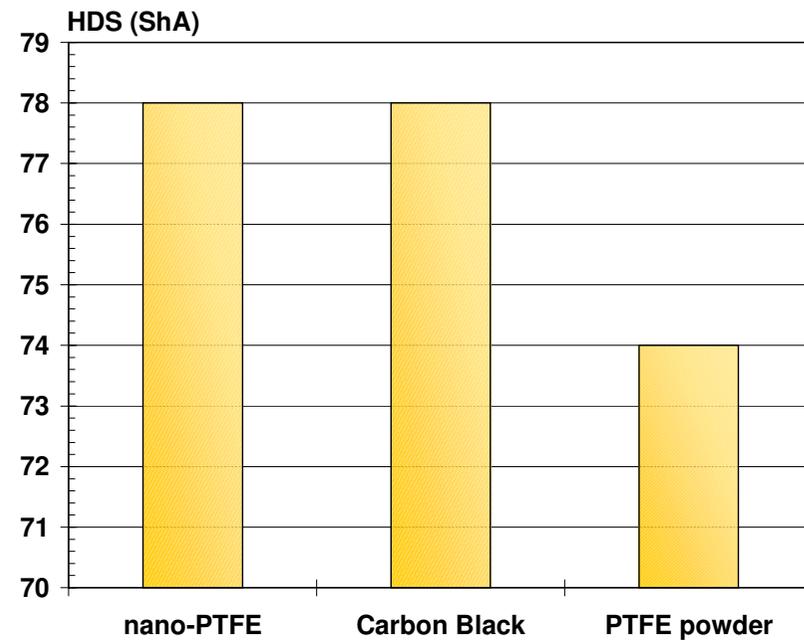
Filler content: 30%wt

Compound Properties

Elongation @ Break



Hardness

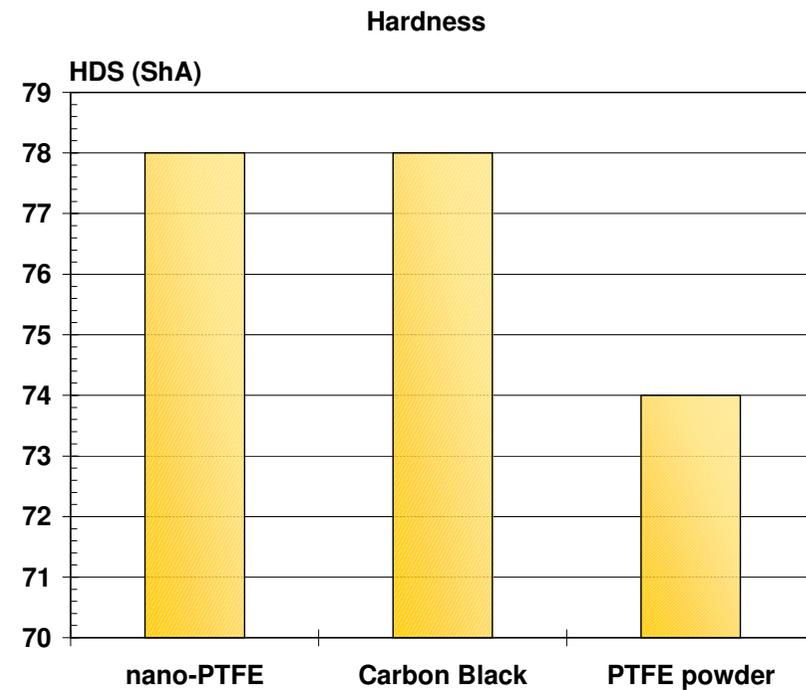
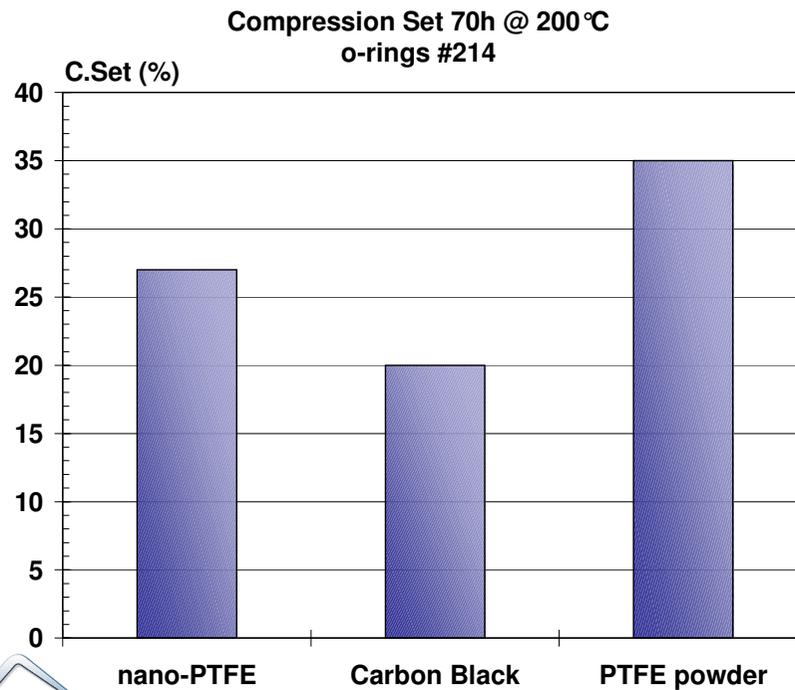


Effect of filler type

Mechanical Properties

Filler content: 30%wt

Compound Properties

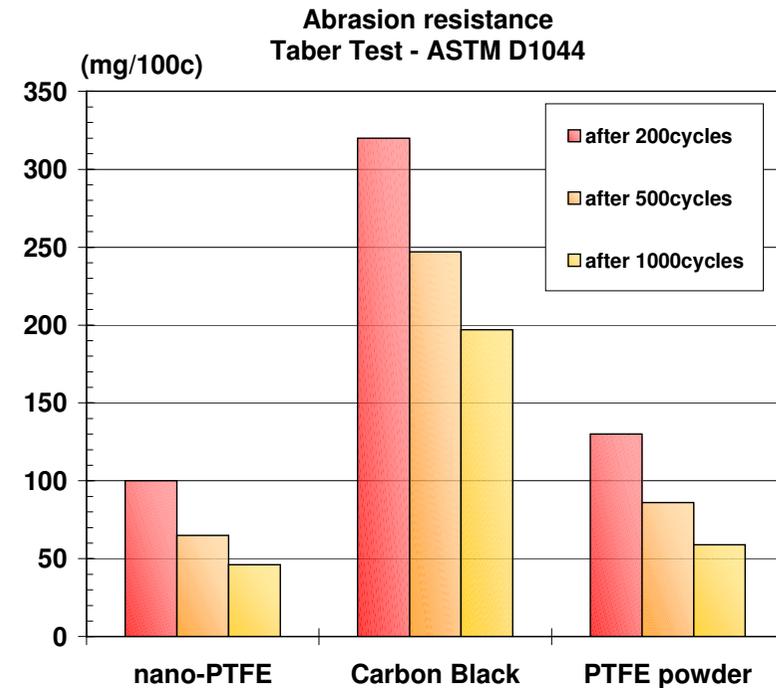
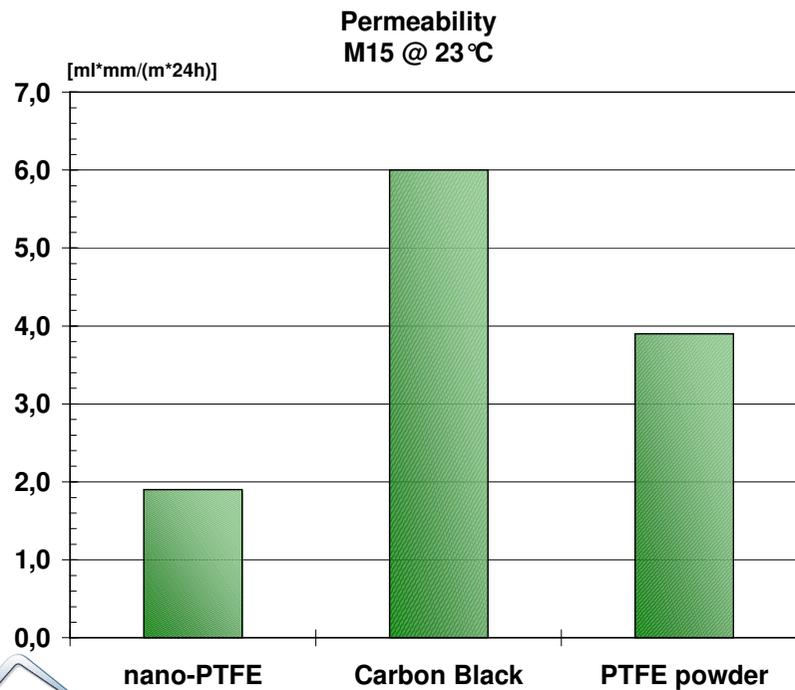


Effect of filler type

Physical and Chemical Properties

Filler content: 30%wt

Compound Properties



PERCO 30/M and PEROX 30M

Compounding with standard mixing equipment:

Open mills

Internal mixers



PTFE powder

- Compounding is difficult
- PTFE agglomeration and fibrillation are likely to occur
- Poor PTFE dispersion
- Poor mechanical properties

nano-PTFE

- **Compounding is easy**
- PTFE agglomeration and fibrillation can be **avoided**
- PTFE dispersion is homogeneous
- **Good mechanical properties**