



# KÄRNTNER MONTANINDUSTRIE MIOX<sup>®</sup>



MICRONIZED AND SUBMICRONIZED  
MICACEOUS IRON OXIDE  
FOR THE PLASTIC INDUSTRY

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# Company profile

The headquarter of Kärntner Montanindustrie (KMI) is located in Wolfsberg, a small town near the Waldenstein mining works.

Wolfsberg castle, once built by the Counts of Henckel von Donnersmarck, now serves as an impressive and highly visible company seat.



The company is managed from here and provides all marketing, sales, administration and quality management activities together with the control of the world wide trade with industrial minerals.

## **Business Objective**

Kärntner Montanindustrie wants to be seen by its customers as a synonym for product innovation and customer orientation. It is the company's objective to further extend its position as a major player and to develop new market segments and markets.



## **Worldwide Exports**

With an export rate of more than 95 % Kärntner Montanindustrie is the world's leading producer and distributor of micaceous iron oxide. Our products are exported to more than 80 countries and this number keeps growing every year. From offshore platforms in the North Sea to Middle Eastern refineries, from the Bosphorus Bridge in Turkey to the Sidney Harbour Bridge in Australia – Kärntner Montanindustrie products are used all over the world. They are used for heavy-duty anti-rust protection, decorative metal protection and in the plastics and ceramic industry.

# MIOX<sup>®</sup> market segments

- Coating Decorative



- Coating Anticorrosion



- Ceramic Industry



# MIOX<sup>®</sup> Innovative mineral Filler for Polymer Industry

- Polymer Compound



- Polymer Masterbatch





# Demands on Polymer Fillers

- Process stability
- Compatibility with polymer matrix
- Easy handling
- Constant quality and supply security
- Surface modification



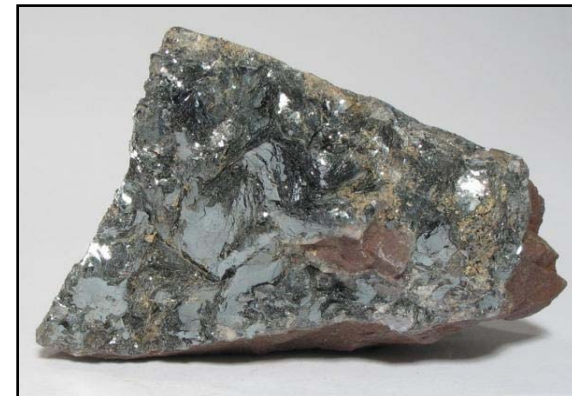
# Functional Fillers for Polymers

## Basic properties:

- Aspect ratio
- Particle size distribution
- Chemical properties
- Physical properties
- Optics, Haptic, Organoleptic

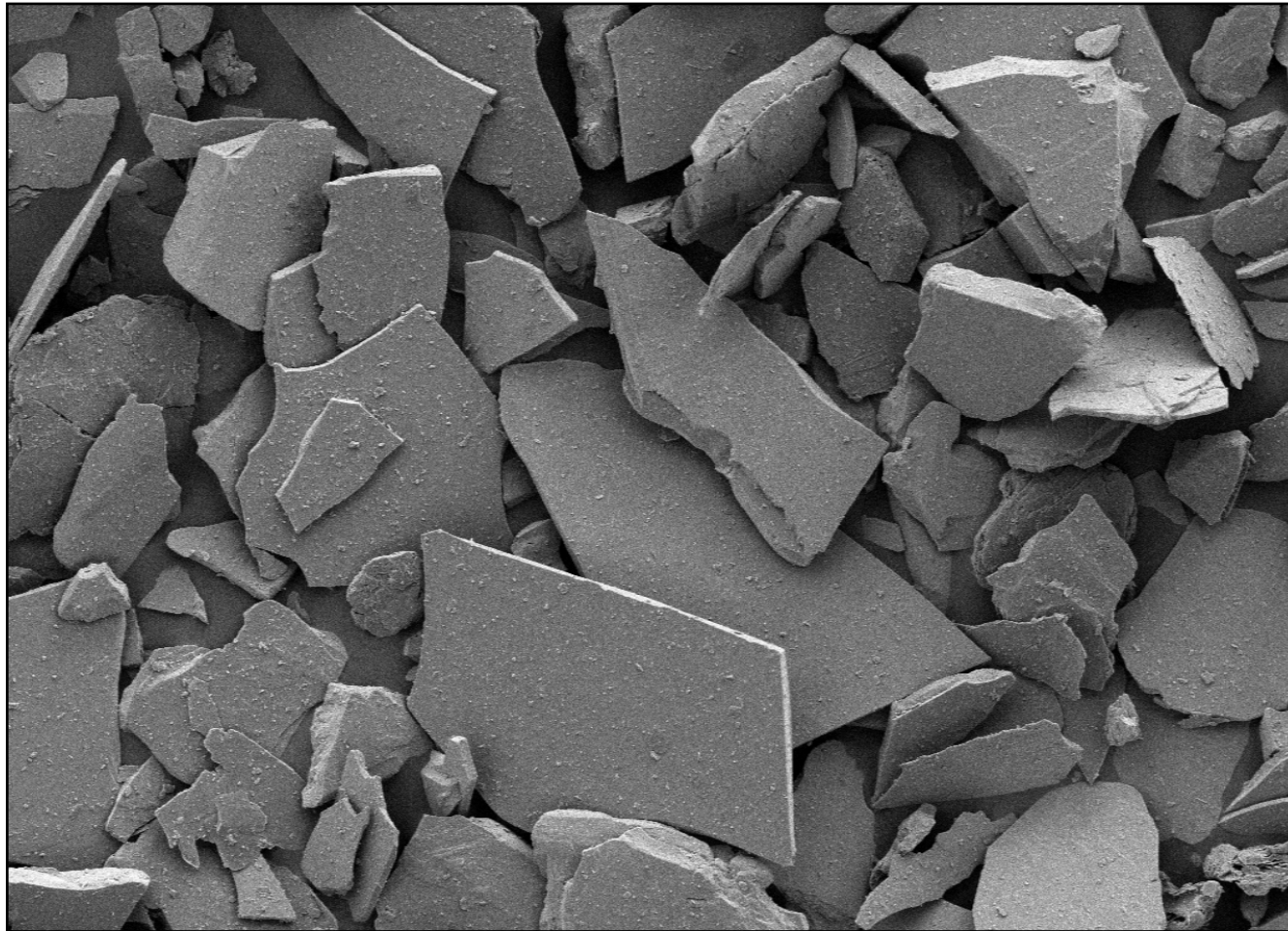
# MIOX<sup>®</sup> properties

- Mineralogy: Hematite, Specularite
- Chem. formula:  $\text{Fe}_2\text{O}_3$  (iron-III-oxide)
- Colour: dark grey to reddish brown, metallic
- Shape: platy
- Density: 4,8 g/cm<sup>3</sup>
- Hardness: 6,0–6,5 Mohs





# Lamellar structure of MIOX<sup>®</sup>



40  $\mu$ m



# MIOX<sup>®</sup> MICRO

Product	<b>MICRO 20</b>	<b>MICRO 30</b>	<b>MICRO 40</b>	<b>MICRO 50</b>
Colour	grey / metallic sheen	grey / metallic sheen	grey / metallic sheen	grey / metallic sheen
Particle geometry	lamellar	lamellar	lamellar	lamellar
Density g/cm <sup>3</sup>	4.8	4.8	4.8	4.8
Bulk Density g/cm <sup>3</sup>	1.4	1.4	1.4	1.4
Loss on Ignition (800°C)	< 1.5%	< 1.5%	< 1.5%	< 1.5%
PH Value	9	9	9	9
Oil absorption g/100 g	17	17	17	17
Lamellar Content	90%	90%	90%	90%
Sieve residue	2% / 20 mμ	2% / 32 mμ	2% / 40 mμ	2% / 50 mμ

# MIOX<sup>®</sup> MICRO and SUBMICRO

Product	<b>SUBMICRO 2.5</b>	<b>SUBMICRO 5</b>	<b>SUBMICRO 7.5</b>	<b>MICRO 10</b>	<b>MICRO 15</b>	<b>MICRO 20 R</b>
Color	Red	Red	Red	Red	Red	Red
Particle geometry	lamellar	lamellar	lamellar	lamellar	lamellar	lamellar
Density g/cm <sup>3</sup>	4.8	4.8	4.8	4.8	4.8	4.8
Bulk Density g/cm <sup>3</sup>	1.5	1.5	1.5	1.5	1.5	1.5
Specific Surface BET m <sup>2</sup> /g	3.60	3.00	2.50	1.90	1.90	1.70
Lamellar Content	90%	90%	90%	90%	90%	90%
Particle Size distribution d98 (CILAS 1064)	2.5 μm	5.0 μm	7.5 μm	10.0 μm	15.0 μm	20.0 μm

# Polypropylene – Compounds MIOX<sup>®</sup> MICRO and SUBMICRO

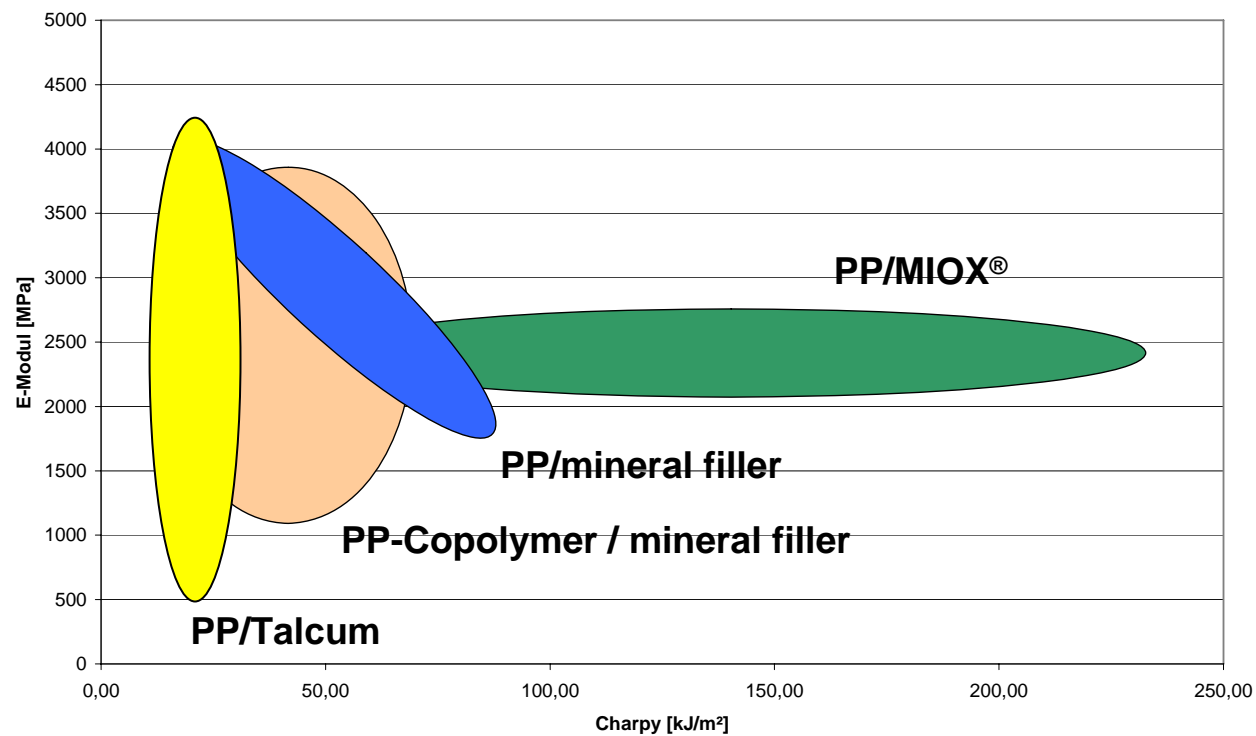
## Properties of Polypropylene Compounds with MIOX<sup>®</sup> MICRO und MIOX<sup>®</sup> SUBMICRO:

- E-Modulus
- Impact Strength – Charpy
- Improvement of Sound Absorption
- Melt Flow Rate MFR
- Scratch resistance acc. Erichsen
- Oxygen permeability
- Electrical properties
- UV-, VIS- and IR- Absorption
- Thermal conductivity

# Functional Fillers

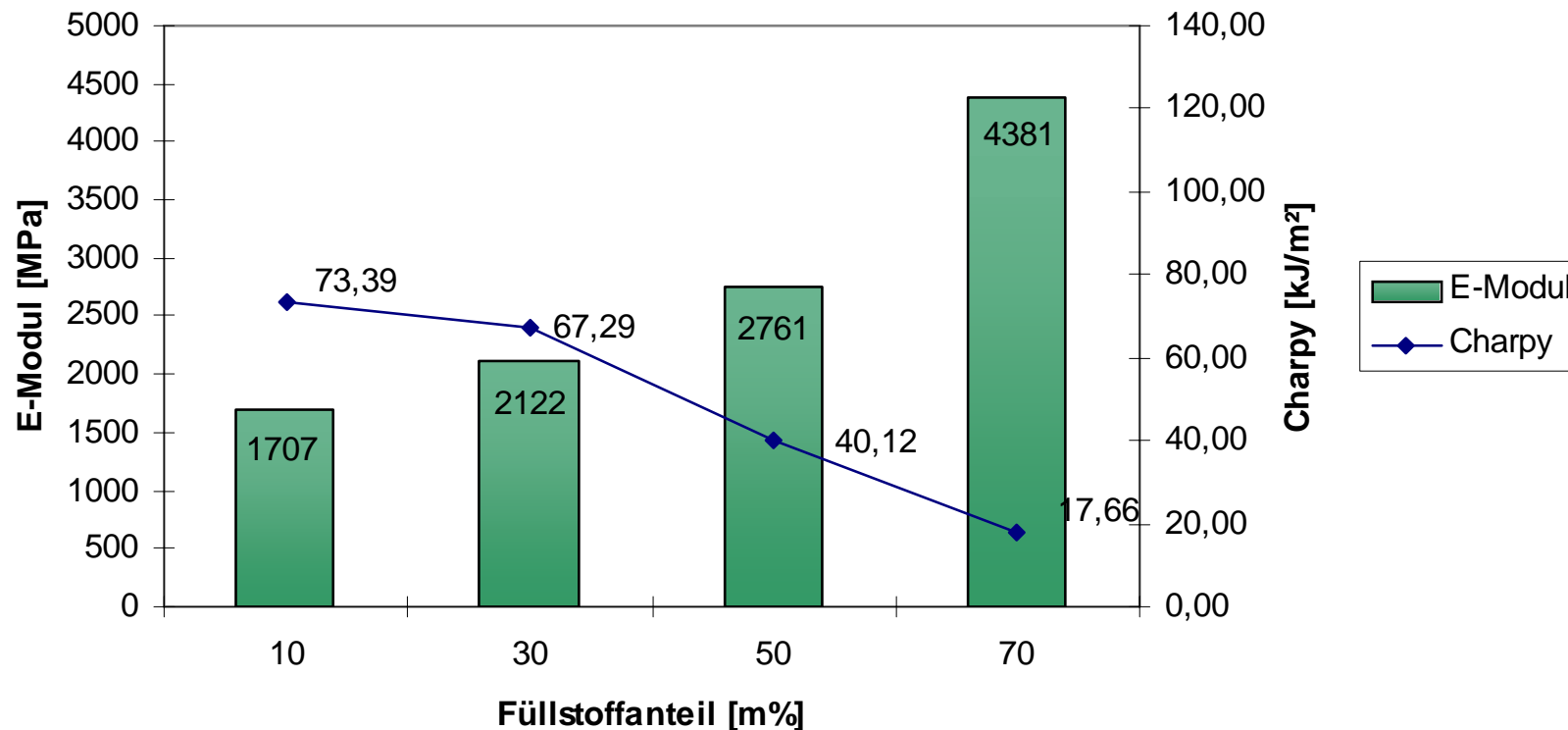
## Polypropylene - Compounds

E-Modulus & Impact strength



# MIOX<sup>®</sup> MICRO 20 R

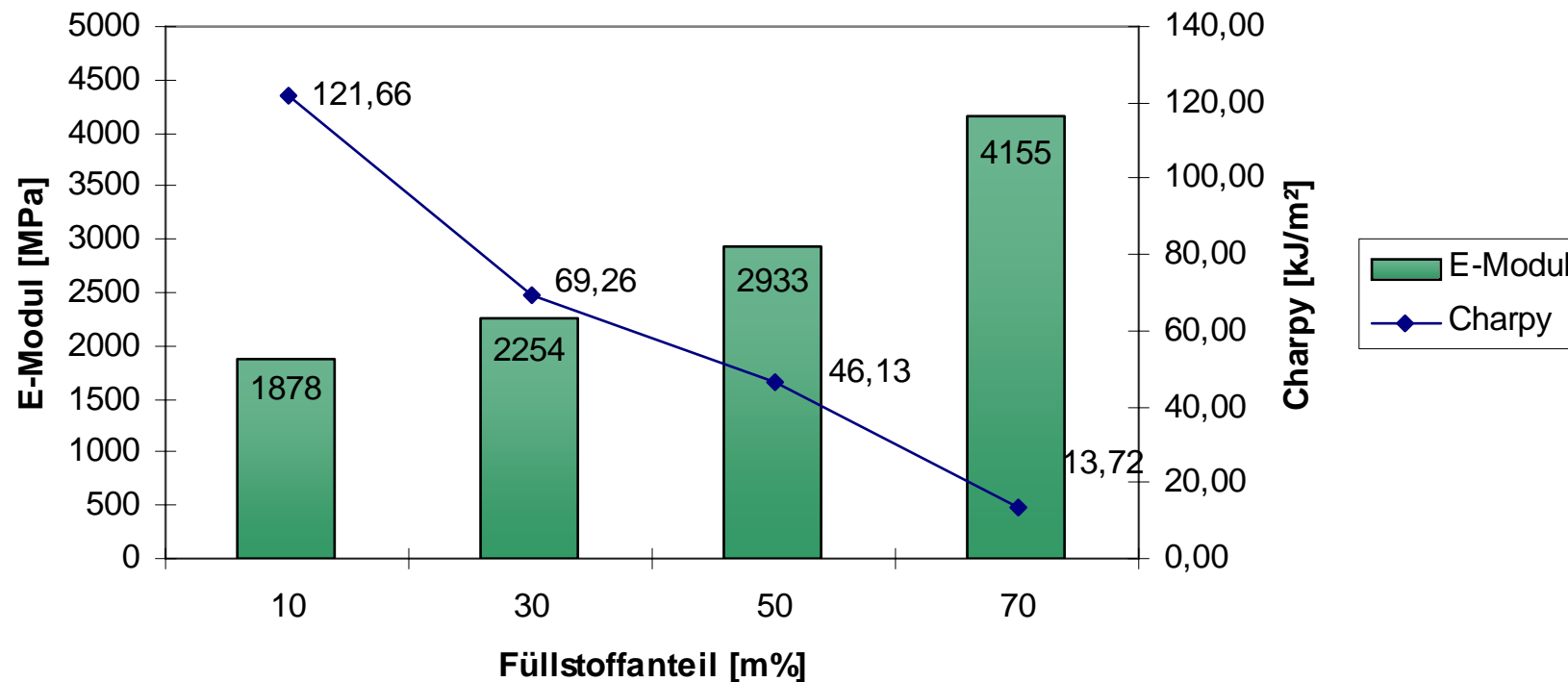
## E-Modulus and Impact strength vs. Filler content



MIOX<sup>®</sup> in Polypropylene Homopolymer

# MIOX<sup>®</sup> SUBMICRO 2.5

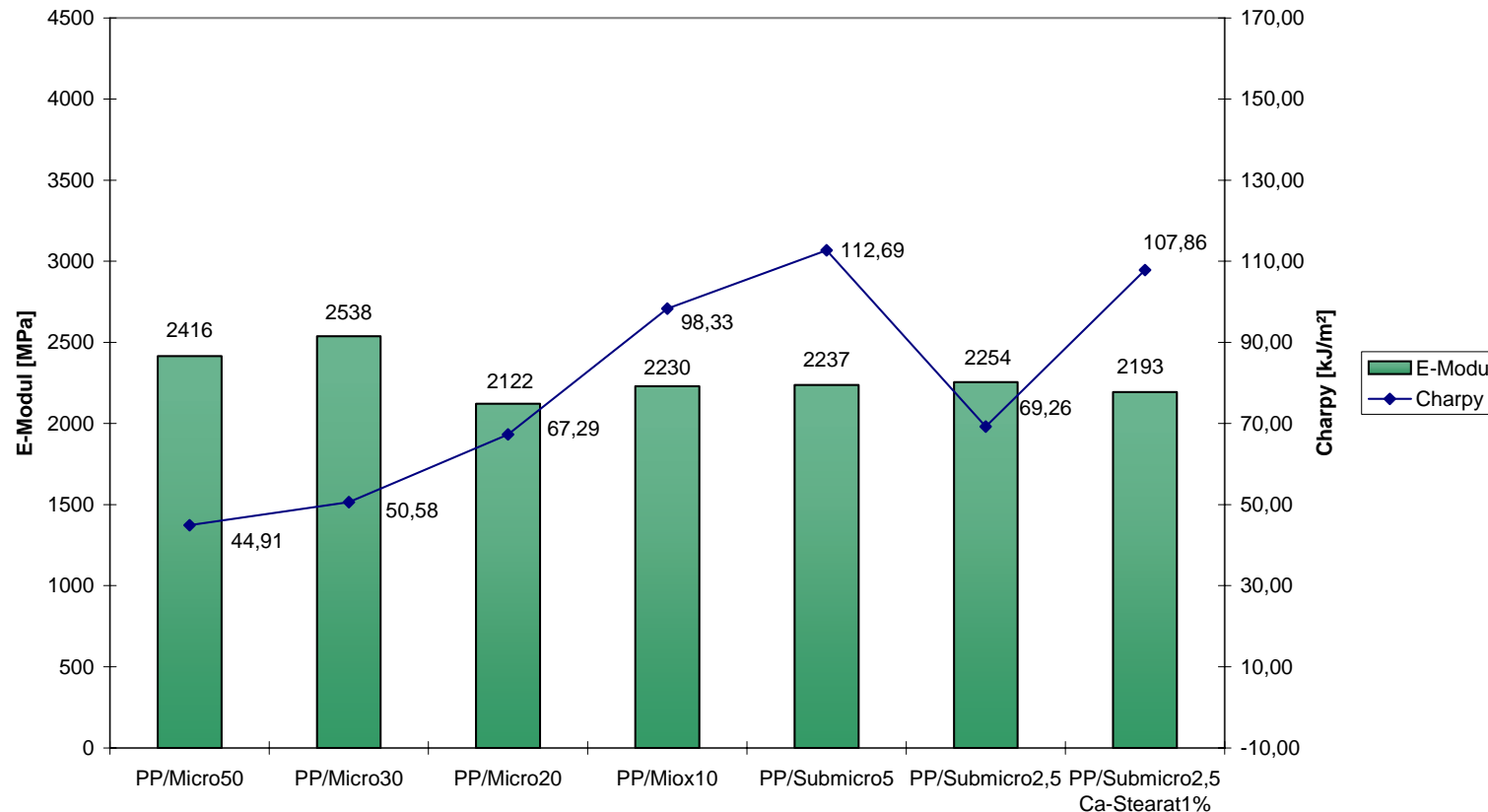
## E-Modulus and Impact strength vs. Filler content



MIOX<sup>®</sup> in Polypropylene Homopolymer

# MIOX<sup>®</sup> Top Cut

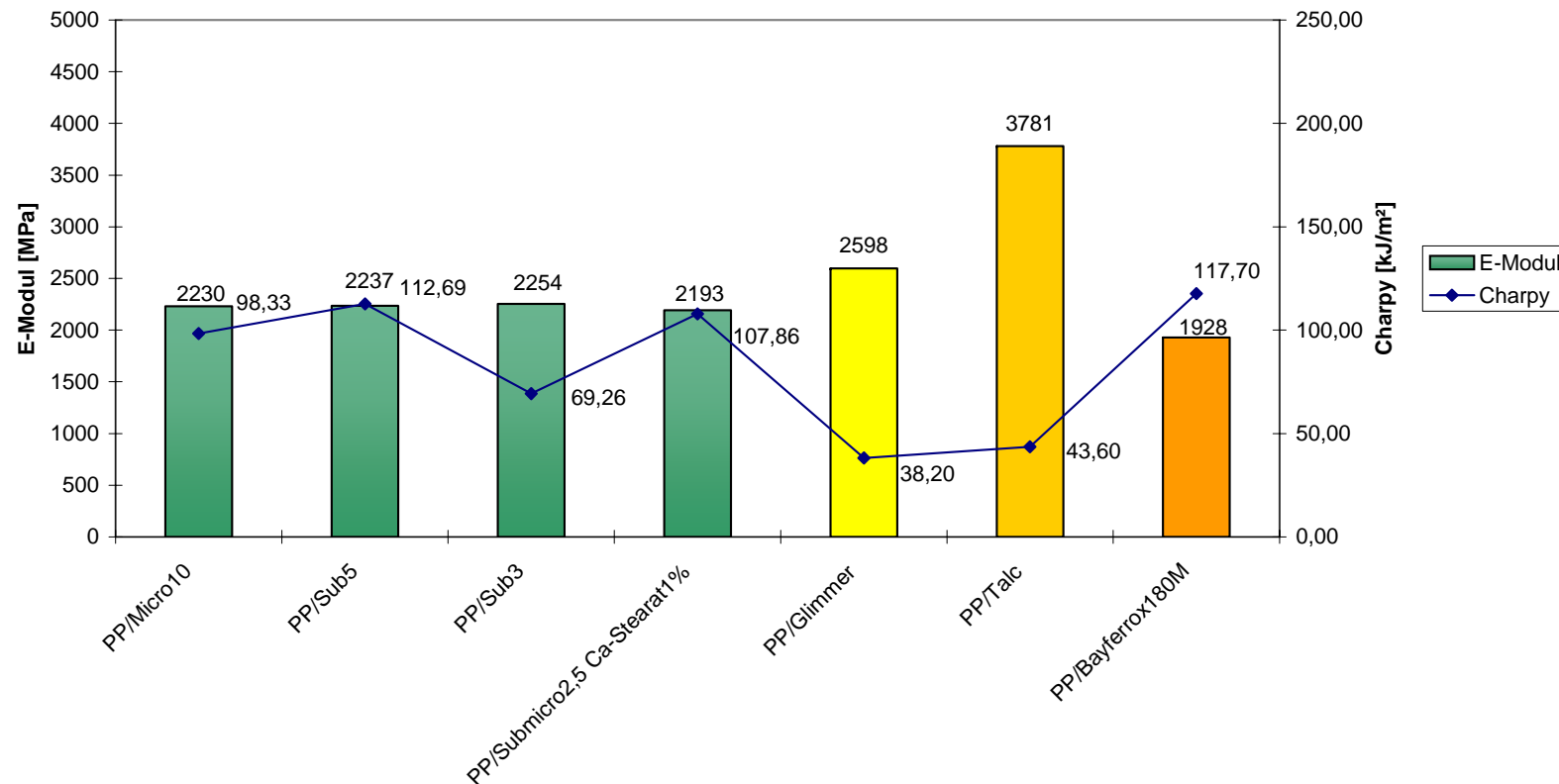
## E-Modulus and Impact strength vs. Particle size



MIOX<sup>®</sup> Filler content 30 m% in Polypropylene

# MIOX<sup>®</sup> vs. mineral Fillers

## E-Modulus and Impact strength vs. Filler type



MIOX<sup>®</sup> Filler content 30 m% in Polypropylene

# Sound absorption of fibers filled with MIOX<sup>®</sup> SUBMICRO

**MIOX<sup>®</sup> SUBMICRO as active filler improves  
sound absorption properties significant !**

**With MIOX<sup>®</sup> SUBMICRO as active filler the  
same level of sound absorption can be  
achieved with reduced amount of fibers !**

# Sound absorption of fibers filled with MIOX<sup>®</sup> SUBMICRO

**Independent Institutes confirmed an  
improvement of Sound absorption**

**up to 50%**

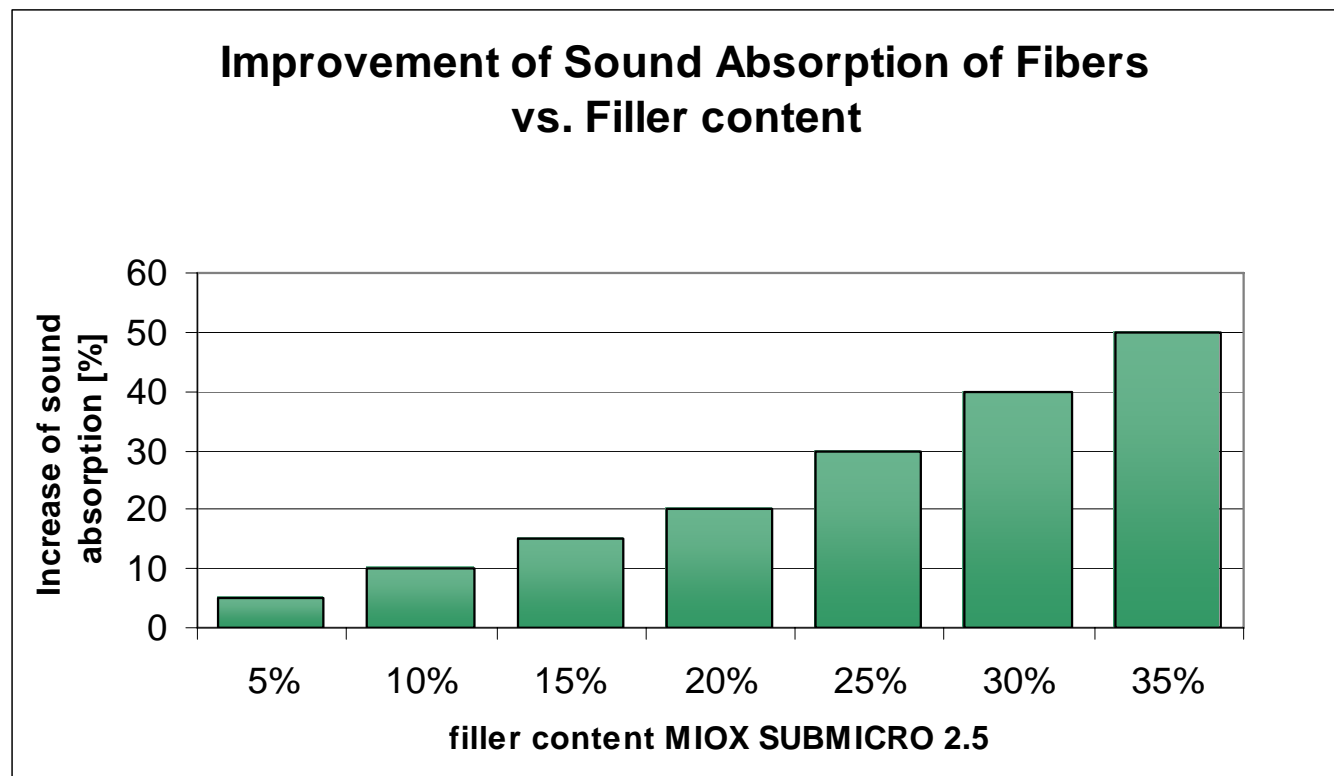
**with MIOX<sup>®</sup> SUBMICRO 2.5 as active filler !**

Test results based on comparative analysis of fibers tested within frequency range 100Hz up to 2.000 Hz, unfilled and with MIOX<sup>®</sup> SUBMICRO 2.5 as active filler.

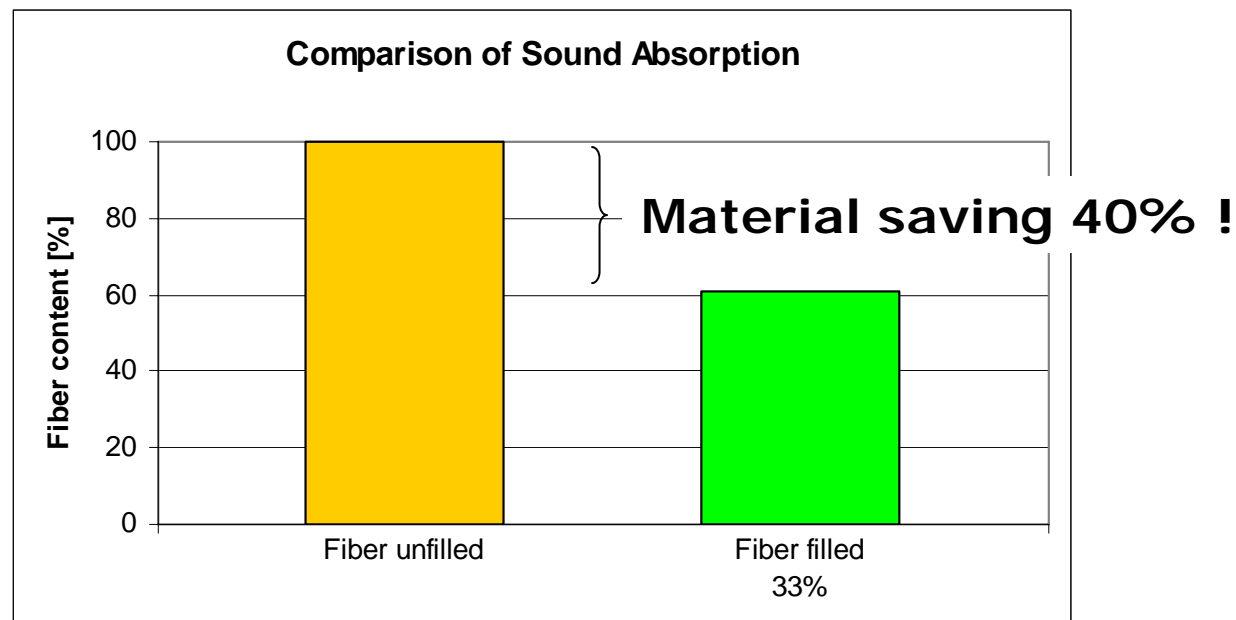


# Improvement of Sound Absorption

## Fibers filled with MIOX® SUBMICRO

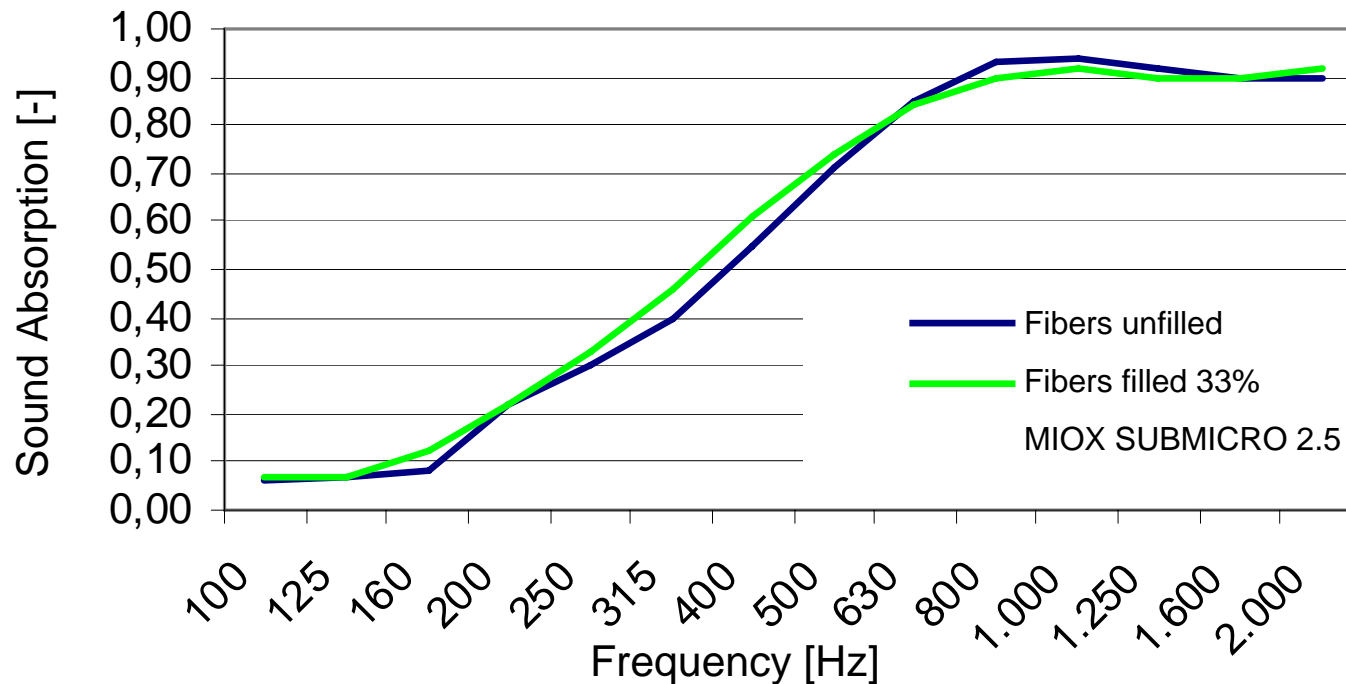


# Fiber reduction with MIOX<sup>®</sup> SUBMICRO as active filler



**The same level of sound absorption can be reached by 40% less fibers filled with 30% MIOX<sup>®</sup> SUBMICRO 2.5 !**

# Sound absorption of fibers filled with MIOX<sup>®</sup> SUBMICRO



**Comparison of sound absorption filled fibers, 40% material reduction, and standard unfilled fibers !**

# MIOX<sup>®</sup> SUBMICRO as active filler for fibers

Tests of leading fiber producers confirmed the excellent processability of MIOX SUBMICRO as filler for fibers.

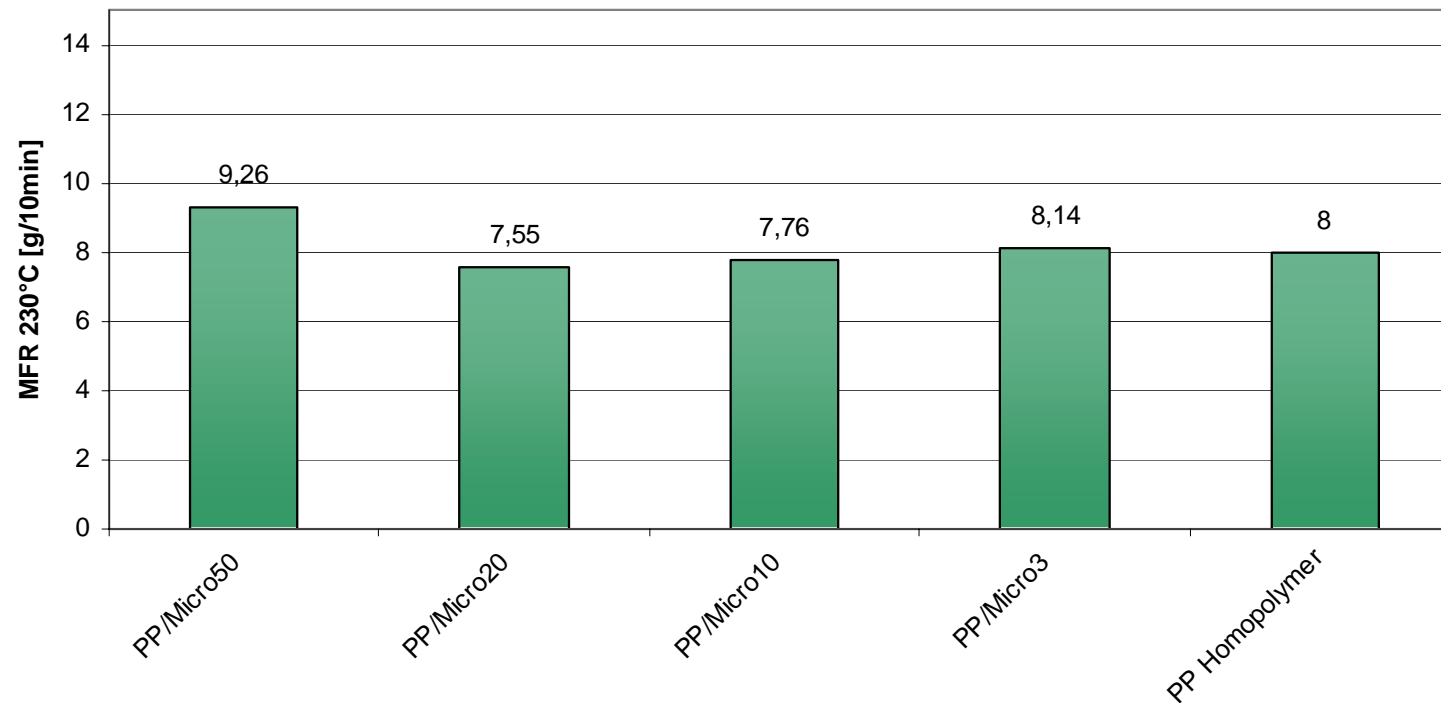
- ✓ Processability confirmed for masterbatch of polymer fibers with filler content of 70% and more !
- ✓ Processability confirmed for slurry with filler content of 70% and more !
- ✓ Processability confirmed for polymer dispersion with high filler content !



# MIOX<sup>®</sup> MICRO and SUBMICRO

## MFR - Melt Flow Rate

Melt Flow Rate MFR

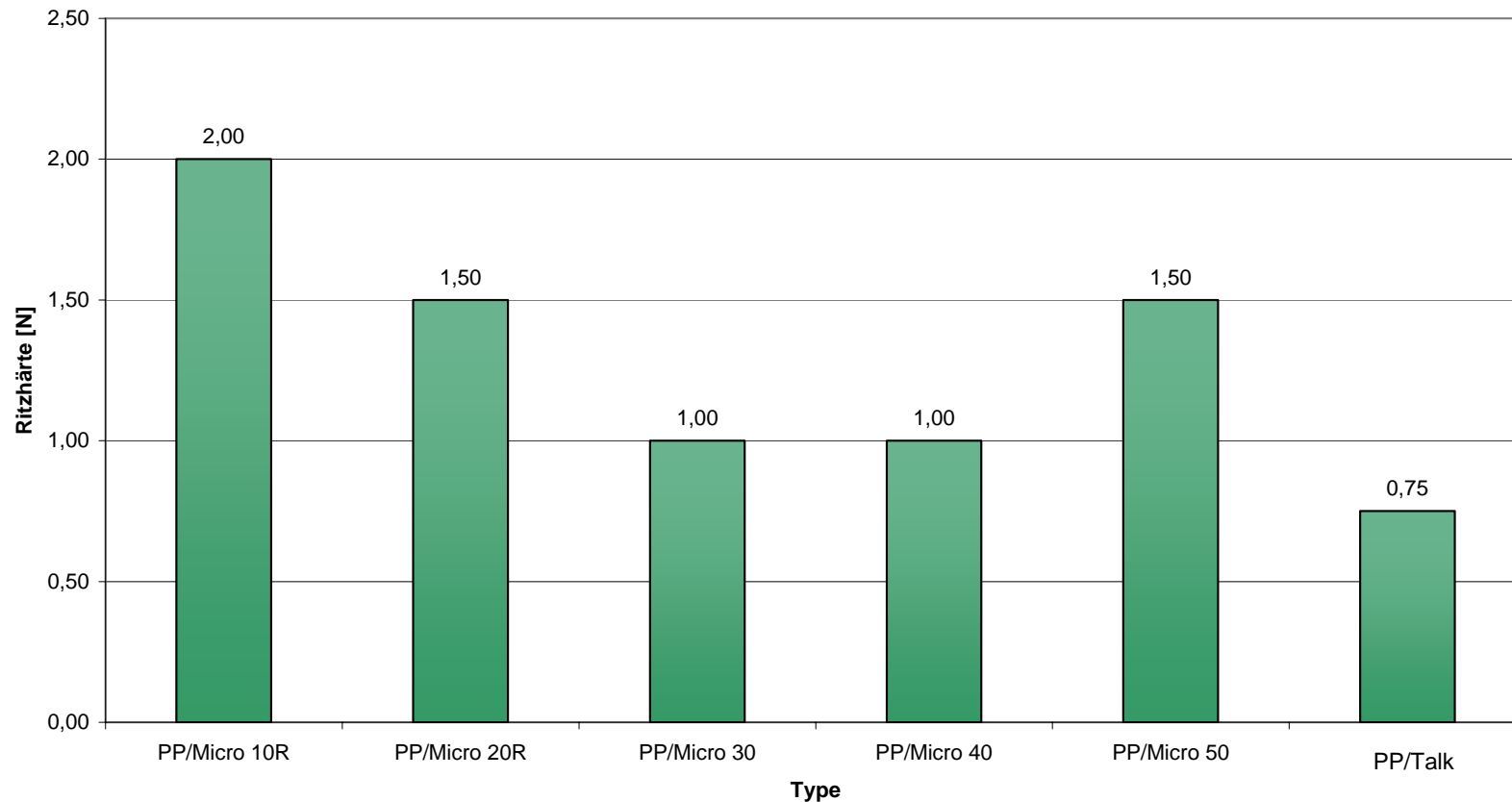


MIOX<sup>®</sup> Filler 30 m% in PP Homopolymer



# MIOX<sup>®</sup> Surface Hardness

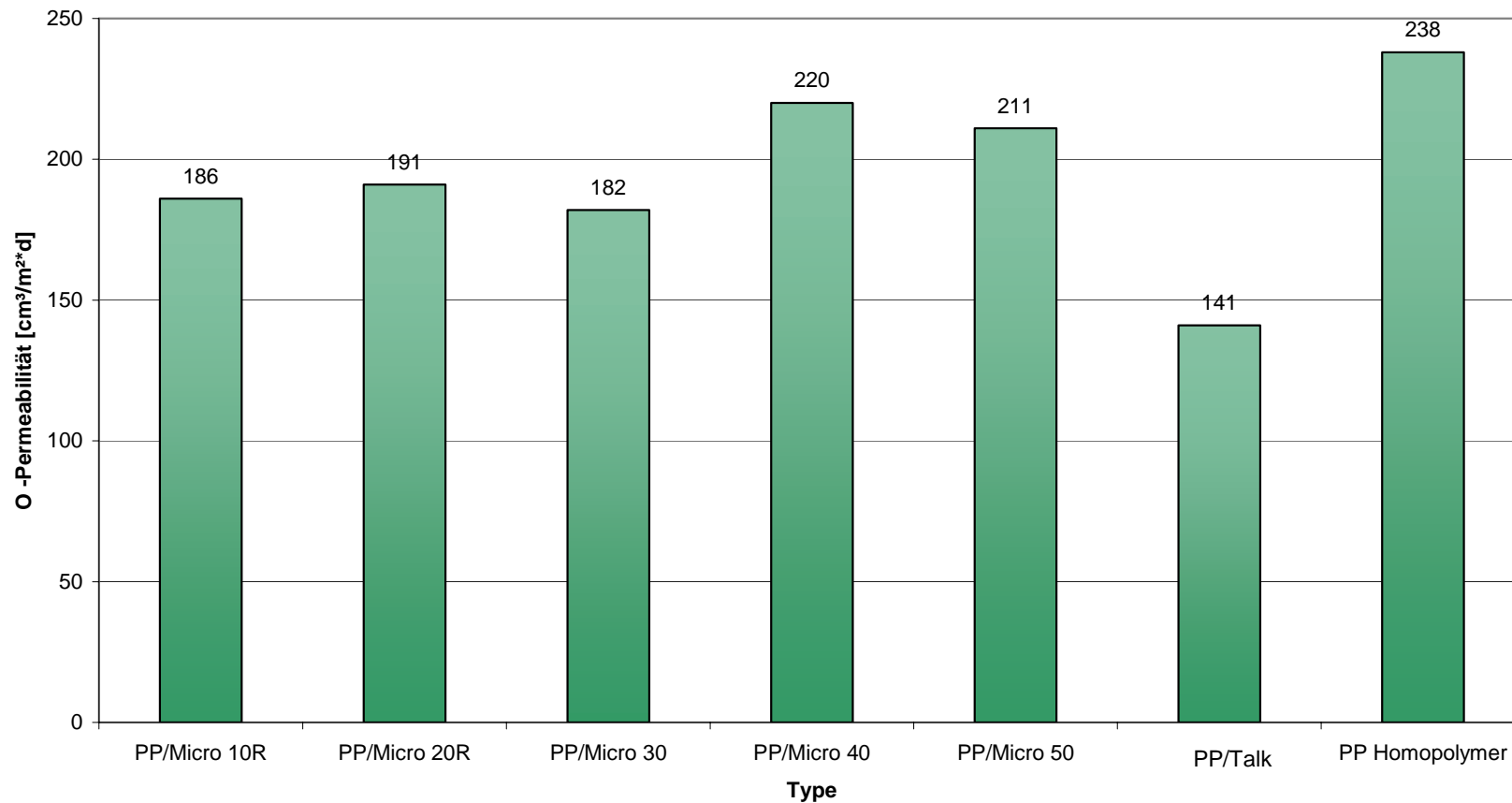
Scratch resistance acc. Erichsen, PP-Compound



MIOX<sup>®</sup> Filler content 30 m% in Polypropylene

# MIOX<sup>®</sup>: O<sub>2</sub> Permeability

## O<sub>2</sub> Permeability (air)

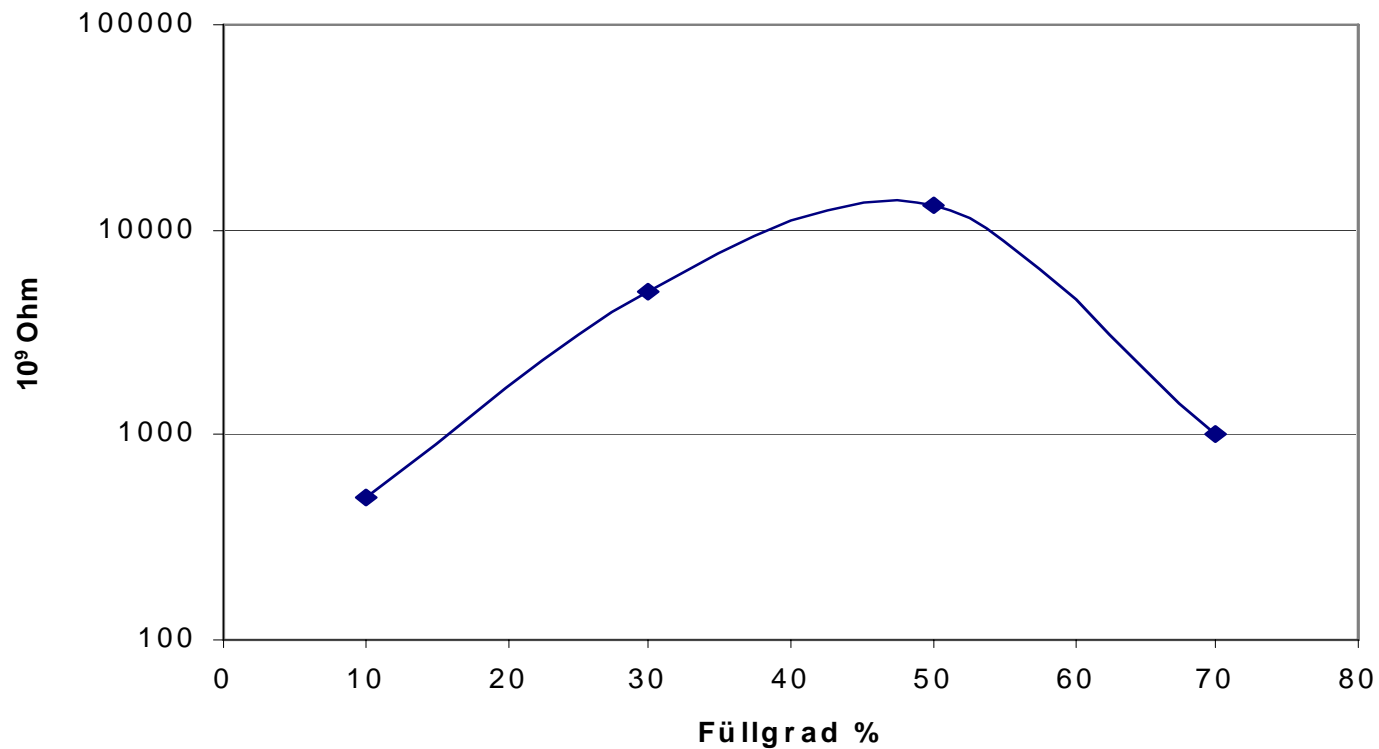


MIOX<sup>®</sup> Filler content 30 m% in Polypropylene

# MIOX<sup>®</sup> MICRO 20 R

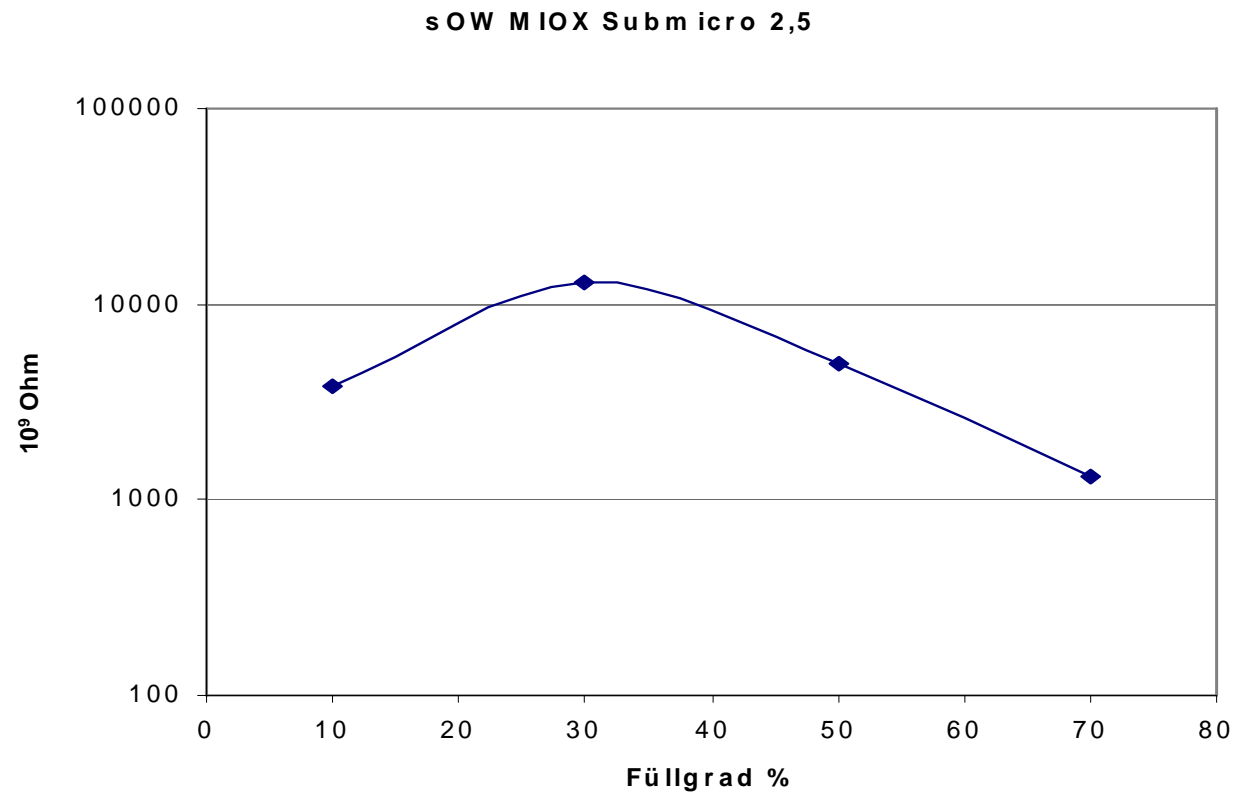
## Specific surface resistance vs. Filler content

sOW MIOX 20



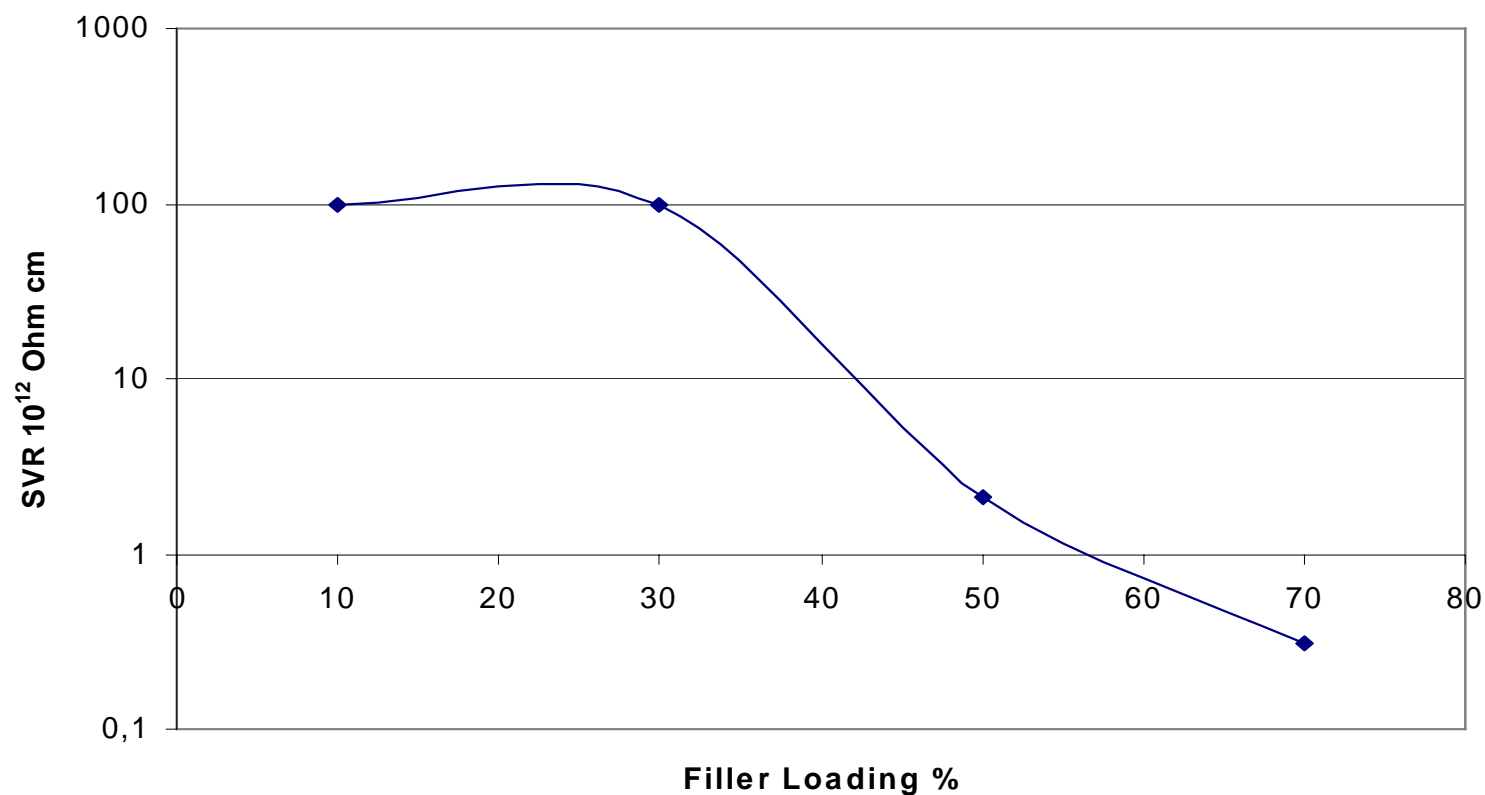
# MIOX<sup>®</sup> SUBMICRO 2.5

Specific surface resistance vs. Filler content



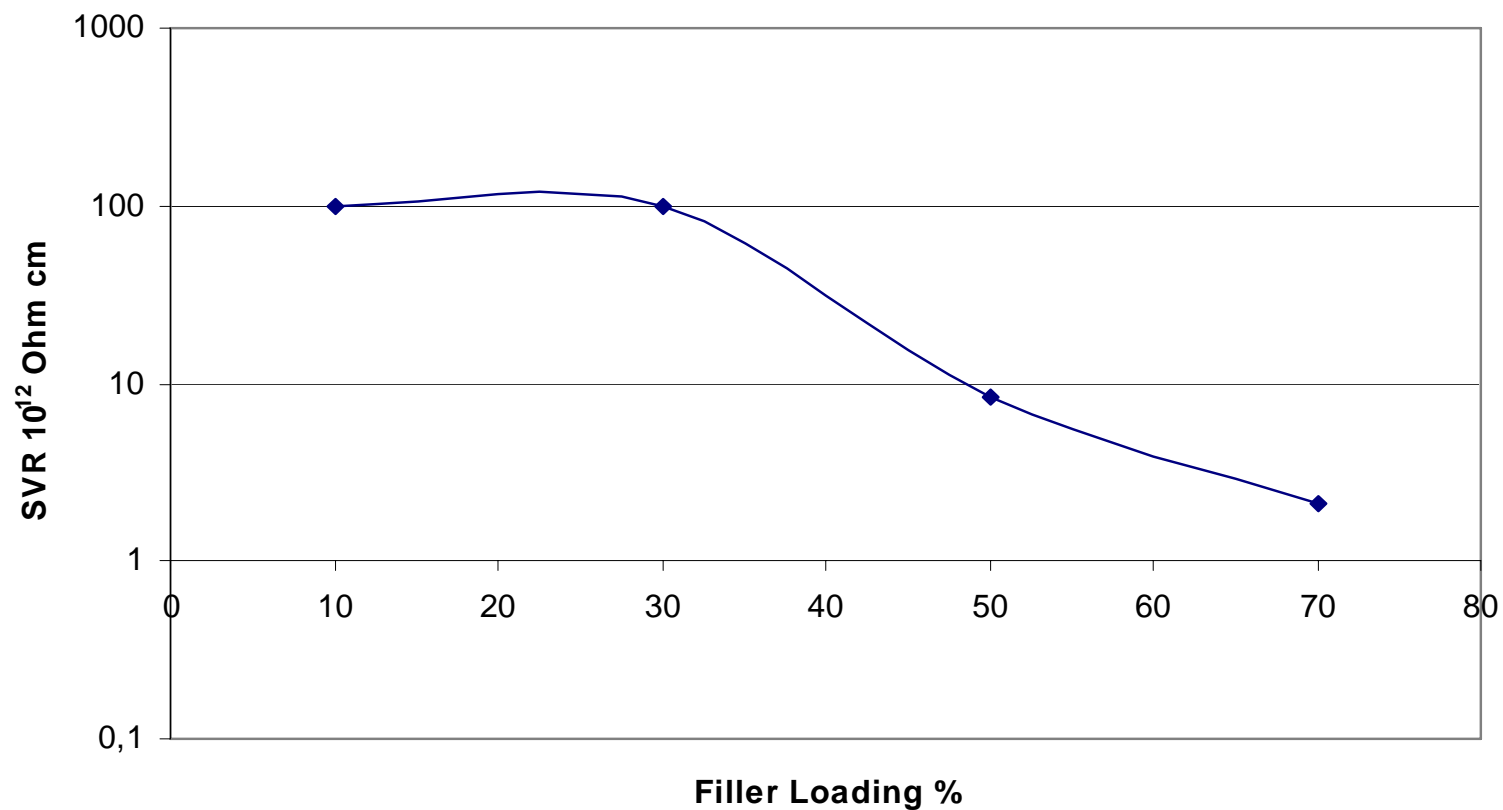
# MIOX<sup>®</sup> MICRO 20 R

Specific volume resistance vs. Filler content

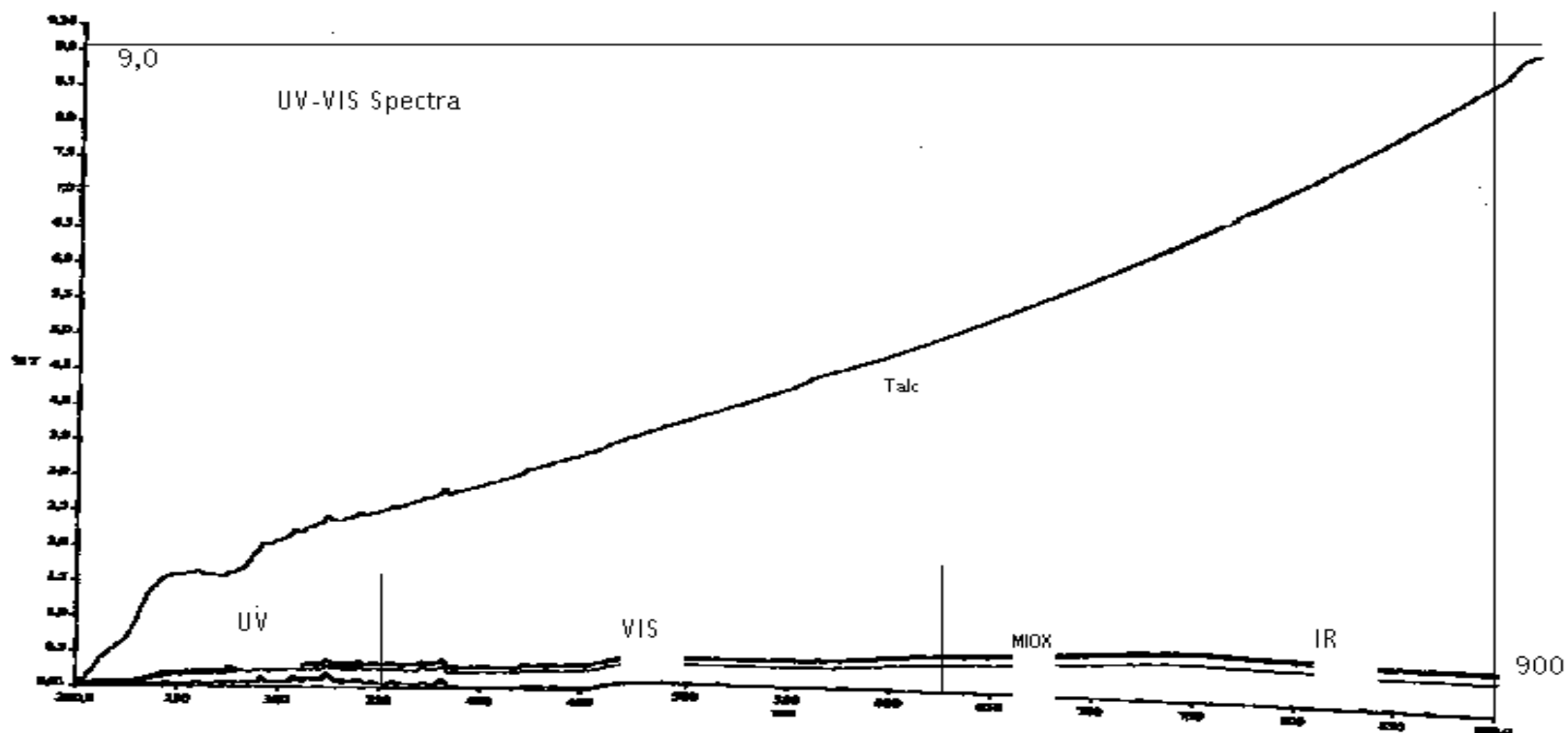


# MIOX<sup>®</sup> SUBMICRO 2.5

Specific volume resistance vs. Filler content

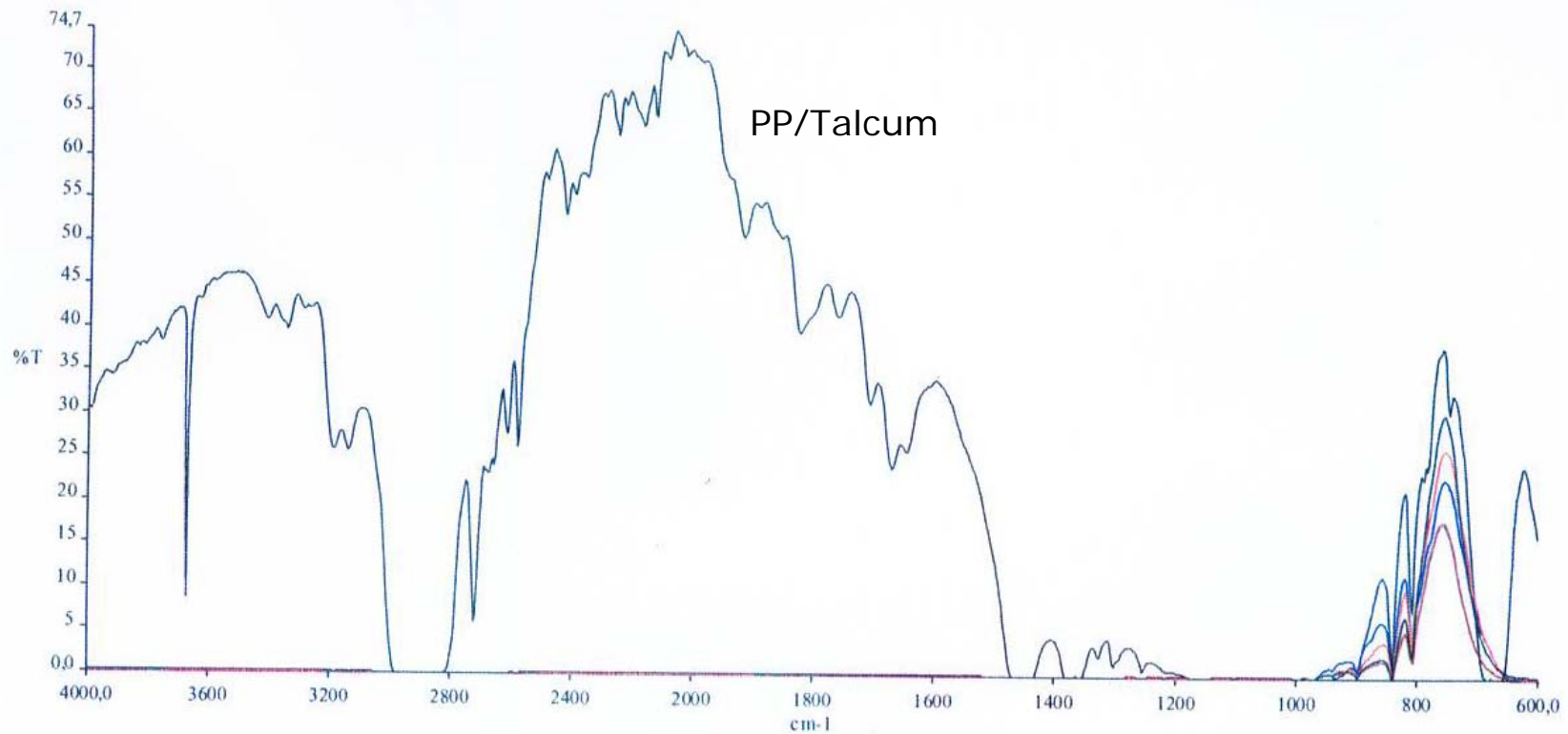


# MIOX<sup>®</sup> IR-VIS-UV Spectra



MIOX<sup>®</sup> Filler content 30 m% in Polypropylene

# MIOX<sup>®</sup> IR-Absorption



MIOX<sup>®</sup> Filler content 30 m% in Polypropylene

# MIOX<sup>®</sup> - Thermal conductivity in polymers

Processing speed of polymers depends on:

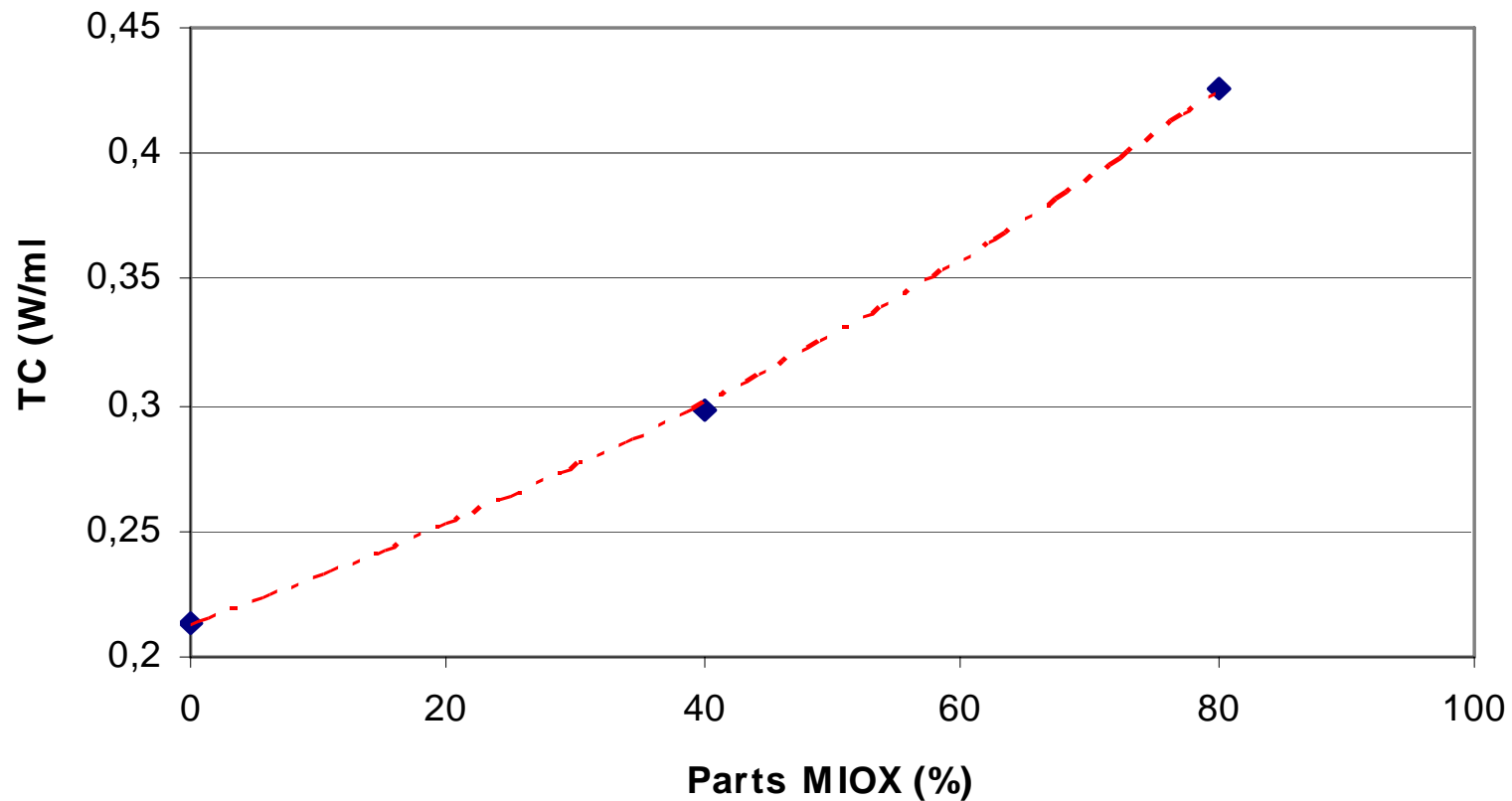
- a) Melting time
- b) Resident time
- c) Cooling Time

a) and c) are directly depending on the thermal conductivity:

doubling the thermal conductivity more or less doubles the processing speed

# MIOX<sup>®</sup> MICRO 20 R

## Thermal Conductivity (TC) (23°C)



MIOX<sup>®</sup> in Polypropylene Homopolymer

# MIOX<sup>®</sup> mineral Fillers

## MIOX<sup>®</sup> Filler increase productivity !

- At 40% filler loading the thermal conductivity is increased by 60%!
- As a consequence the processing speed increases up to 50%!

# MIOX<sup>®</sup> Application matrix

	MIOX <sup>®</sup> MICRO			MIOX <sup>®</sup> SUBMICRO		
Type	MICRO 30 - 50	MICRO 20	SUBMICRO 20R	SUBMICRO 10	SUBMICRO 5	SUBMICRO 2.5
Stiffness	+	+	+	+	+	+
Density	+	+	+	++	++	++
Impact strength	++	++	++	++	++	++
Hardness	+	++	++	++	++	++
IR - Absorption	++	++	++	++	++	++
UV - Absorption	++	++	++	++	++	++
O <sub>2</sub> permeability	-	-	+	+	+	+
Thermal Cond.	++	++	++	++	++	++
Sound Absorption	++	++	++	++	++	++
Viscosity	+	+	+	++	++	++
pigmentation	++	++	-	-	++	++



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# MIOX®

## MICRO 50 – MICRO 20

### Applications

- Metallic Effect
- Sound absorption – sound damping
- Increase thermal conductivity
- IR-VIS-UV Absorption



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MIOX®

MICRO 20 R – SUBMICRO 2.5

Applications

- Red pigment
- Reinforcement of mechanical properties
- Scratch resistance
- IR-VIS-UV Absorption
- Increase thermal conductivity
- Sound absorption – sound damping

# MIOX<sup>®</sup> typical end uses

- Film: horticulture, agriculture, military
- Appliances: shields, housings, plates, kitchen furniture
- Automotive: design, noise reduction, scratch resistance
- Sports: golf balls, vibration dampening
- Pipes and Profiles: sound shielding, draining pipes
- Textile industry: Fibres and fabrics



Beside **MIOX**<sup>®</sup> micaceous iron oxide product range, today Kärntner Montanindustrie can also offer to the plastic industry a range of micronized and submicronized

Wollastonite and Graphite:

## Wollastonite

SUBMICRO 2-10

SUBMICRO 4-15

MICRO 8

MICRO 12

## Graphite

*SUBMICRO 7,5* \*

MICRO 10

MICRO 15

\* Submicronized developmental grade

