Calcined Neuburg Siliceous Earth in PPS and PBT

Dr. Nicole Strübbe

Author: Petra Zehnder

HOFFMANN MINERAL

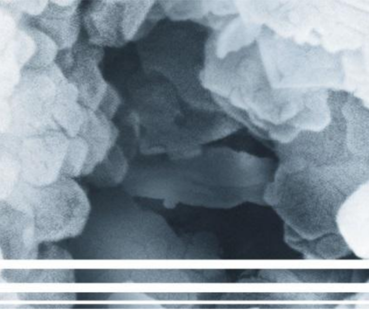
We supply material for good ideas

Calcined Neuburg Siliceous Earth in Polyphenylene sulfide (PPS)

Dr. Nicole Strübbe

Author: Petra Zehnder

HOFFMANN MINERAL
We supply material for good ideas



Status Quo

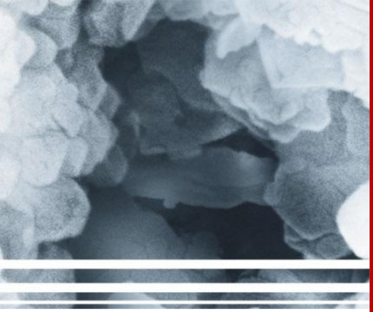
HOFFMANN MINERAL

- PPS is typically used for mechanical, thermal and chemical highly stressed moldings in the automotive, machinery and electrical industries

- Important properties are – apart from high strength and stiffness – excellent thermal stability and the outstanding chemical resistance to solvents, acids and alkalis

- Glass beads are often used to customize properties

- Mineral filled compounds have been hardly available



Objective

Assessment of the performance of

calcined Neuburg Siliceous Earth

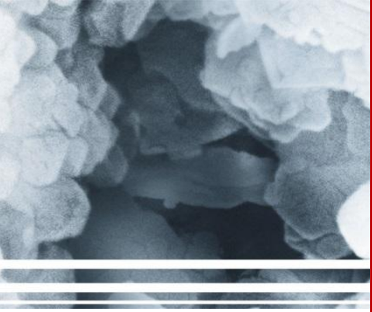
versus

glass beads in PPS regarding

» Flow

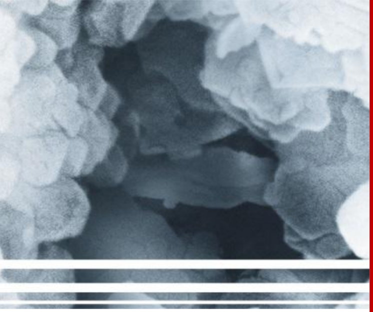
» Mechanical properties
- Tensile test
- Flexural test
- Impact strength

» Color of compounds



Fillers and Characteristics

Filler	Description	Surface treatment
Glass beads	d_{50}: 15-30 µm, d_{90}: 30-80 µm	Yes
Silfit Z 91	Calcined Neuburg Siliceous Earth d_{50}: 2 µm, d_{97}: 10 µm	None
Aktifit AM	Basis: Silfit Z 91	Amino silane
TP 2014005	Basis: Silfit Z 91	Alternative amino silane

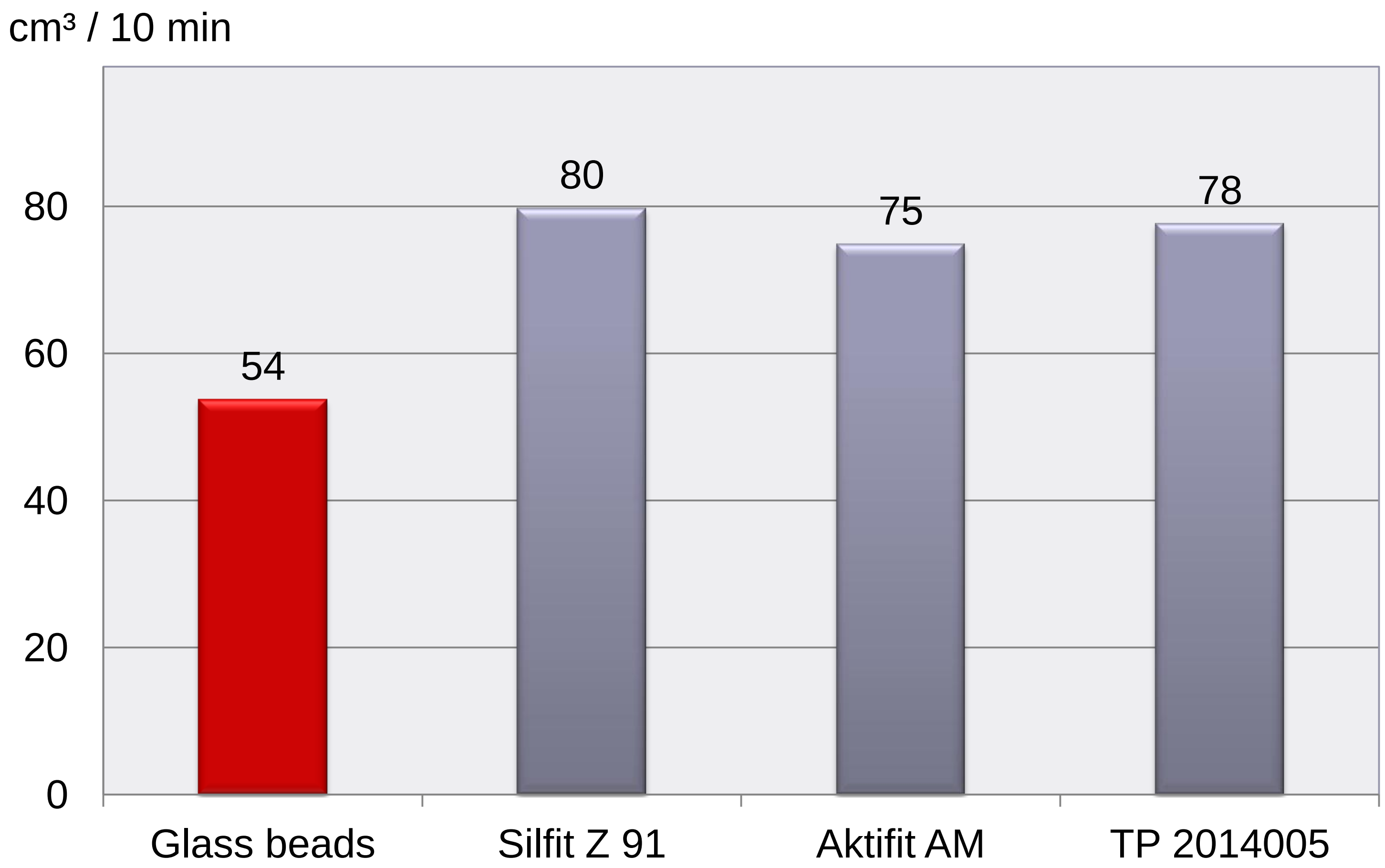


Compounding
Injection Molding

Composition	60 % PPS 40 % Filler
Compounding	Twin screw extruder ZSK 30
Injection molding of test specimens acc. to ISO 1874	Mold acc. to ISO 294 Mold temperature: 150 °C Melt temperature: 315 °C

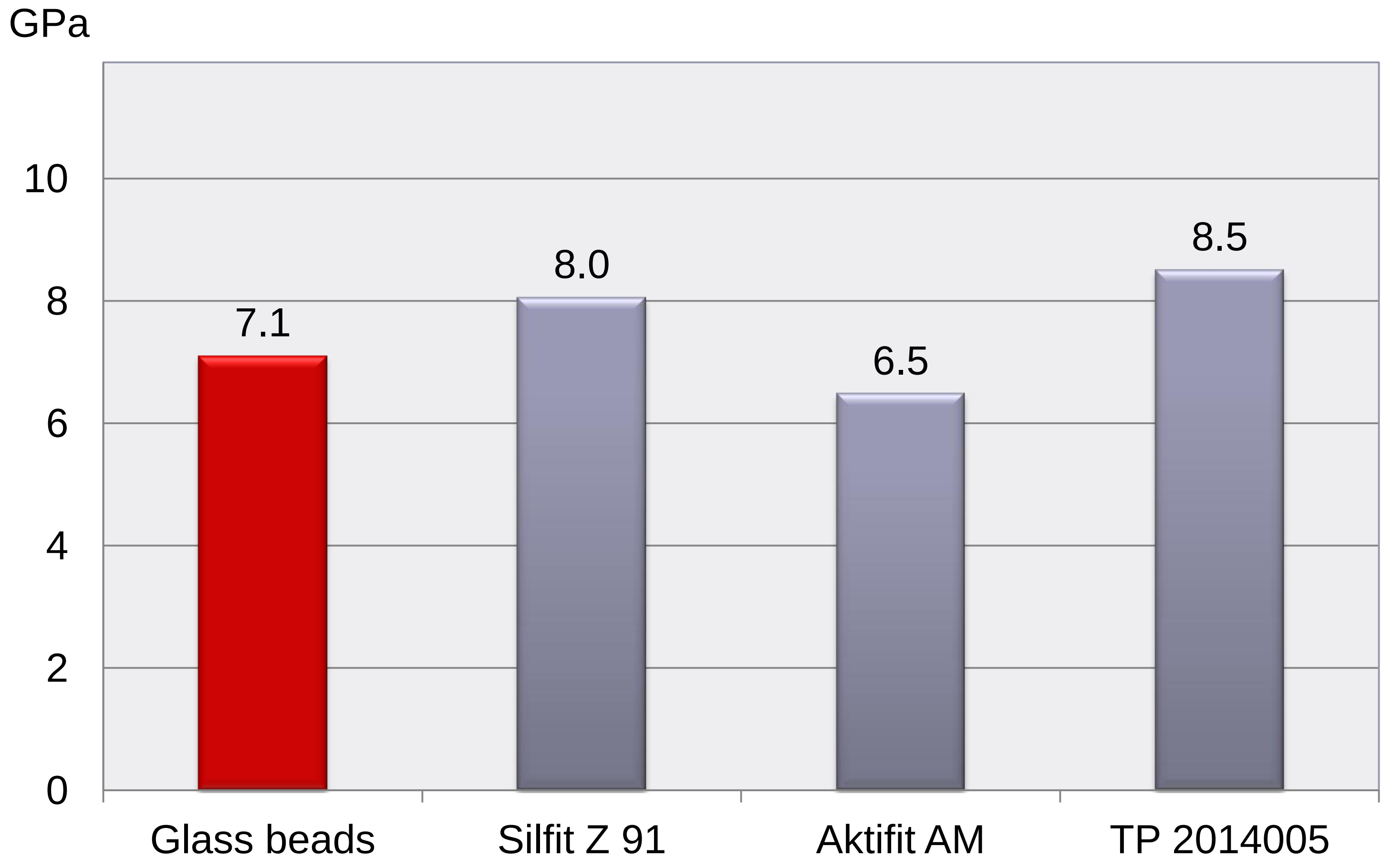
Melt Volume-flow Rate

DIN ISO 1133; 300 °C, 5 kg



Tensile Modulus

DIN EN ISO 527-1,-2; 1 mm/min



INTRODUCTION

EXPERIMENTAL

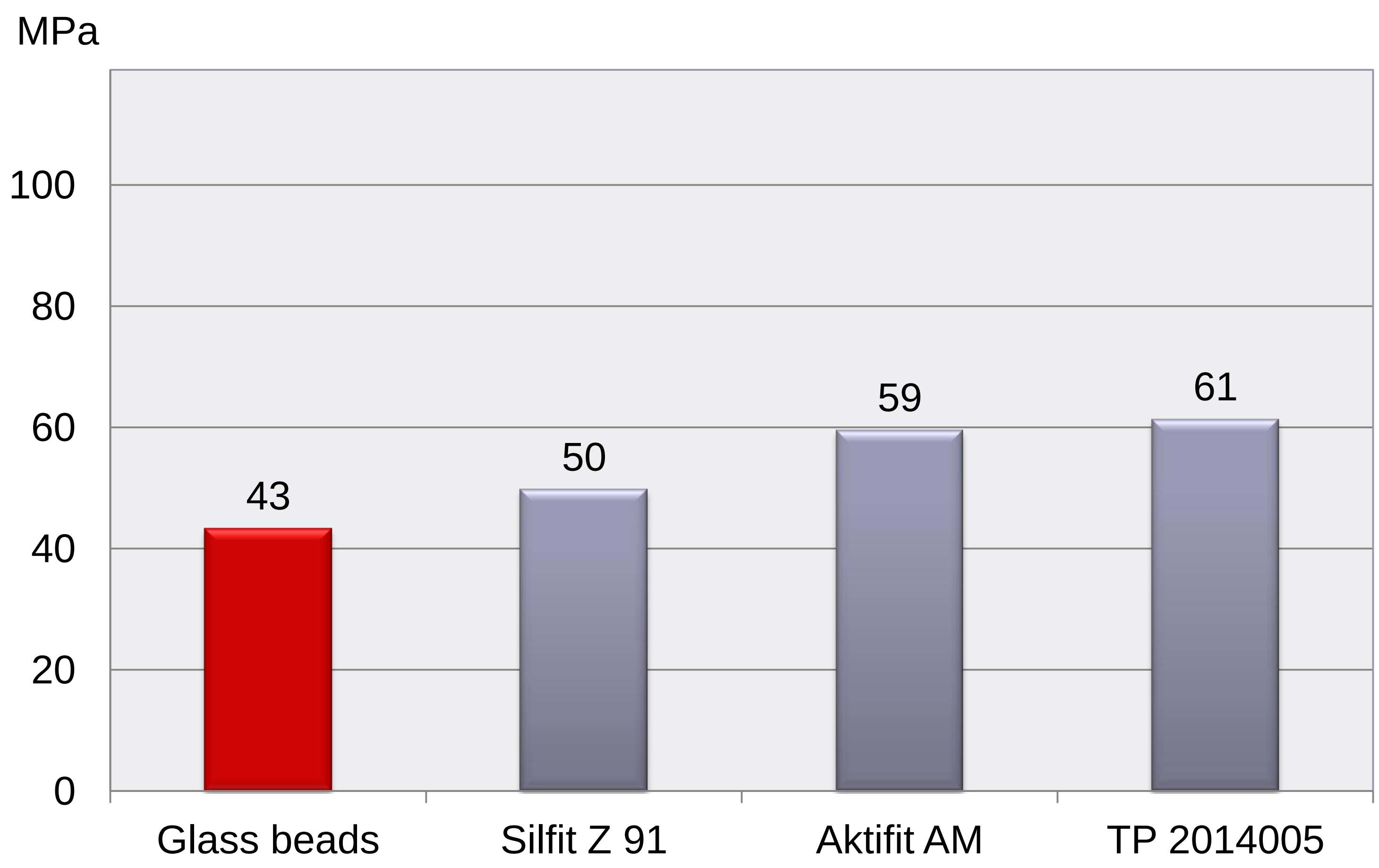
RESULTS

SUMMARY

APPENDIX

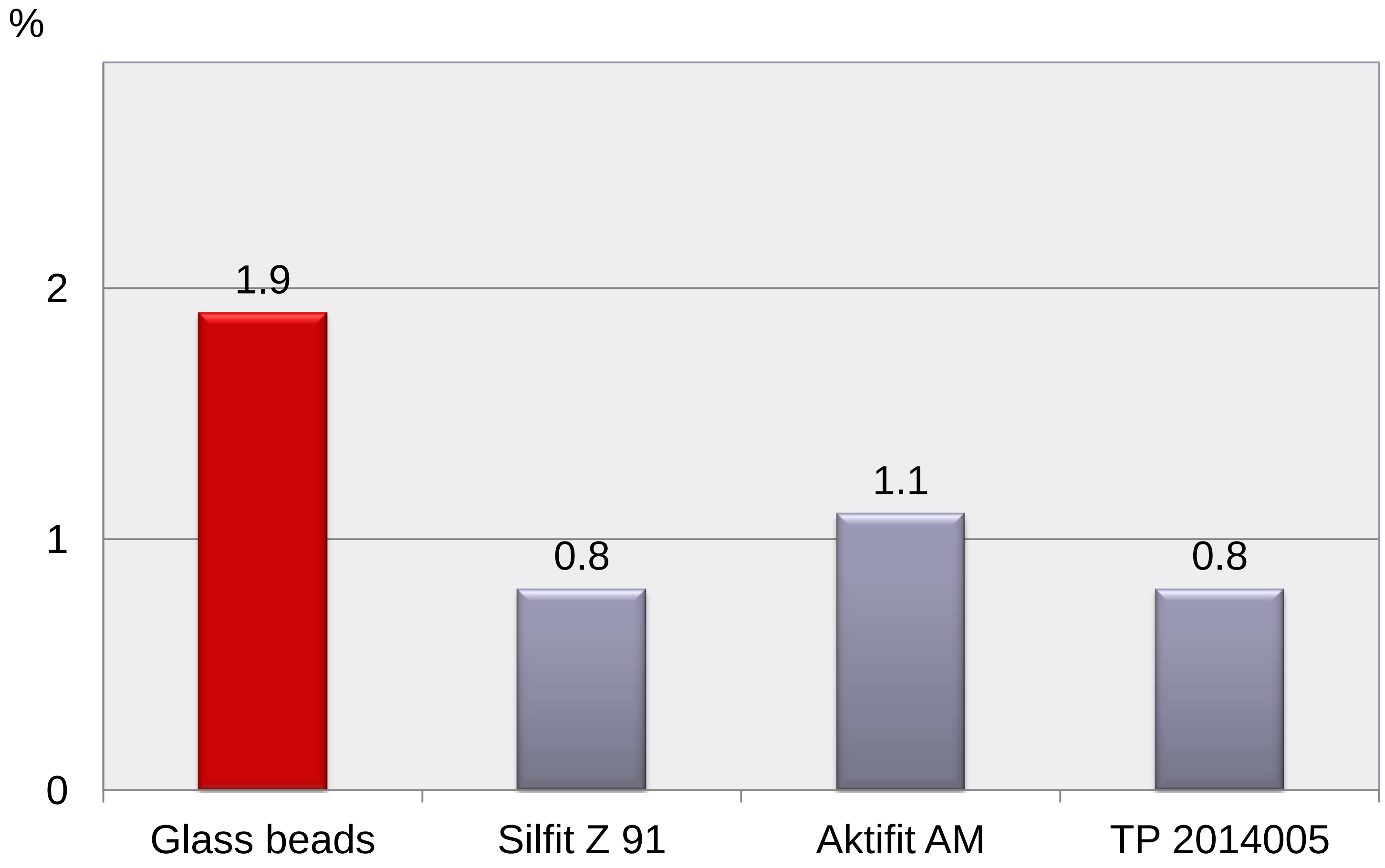
Tensile Strength

DIN EN ISO 527-1,-2; 5 mm/min



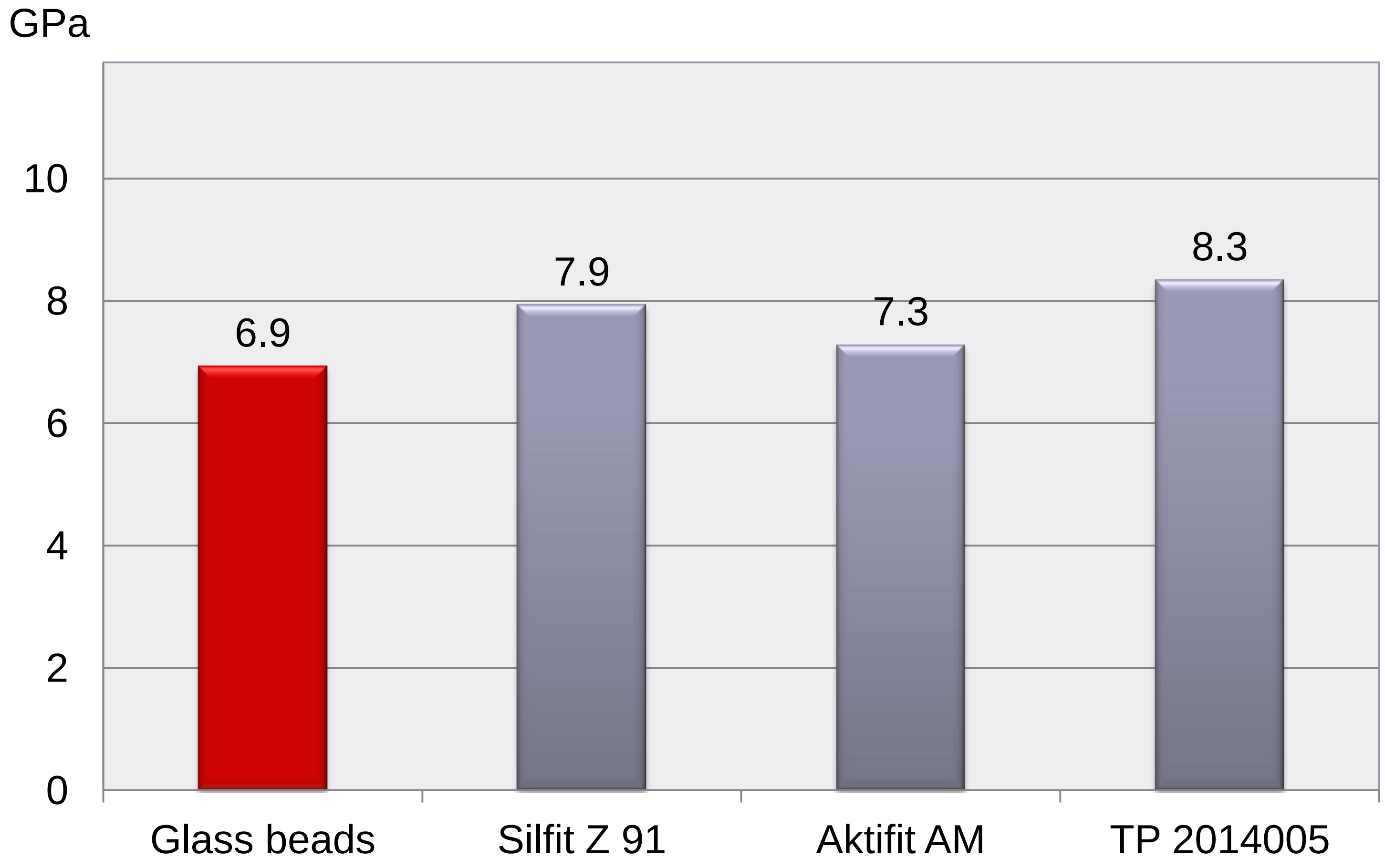
Tensile Strain at Break

DIN EN ISO 527-1,-2; 5 mm/min



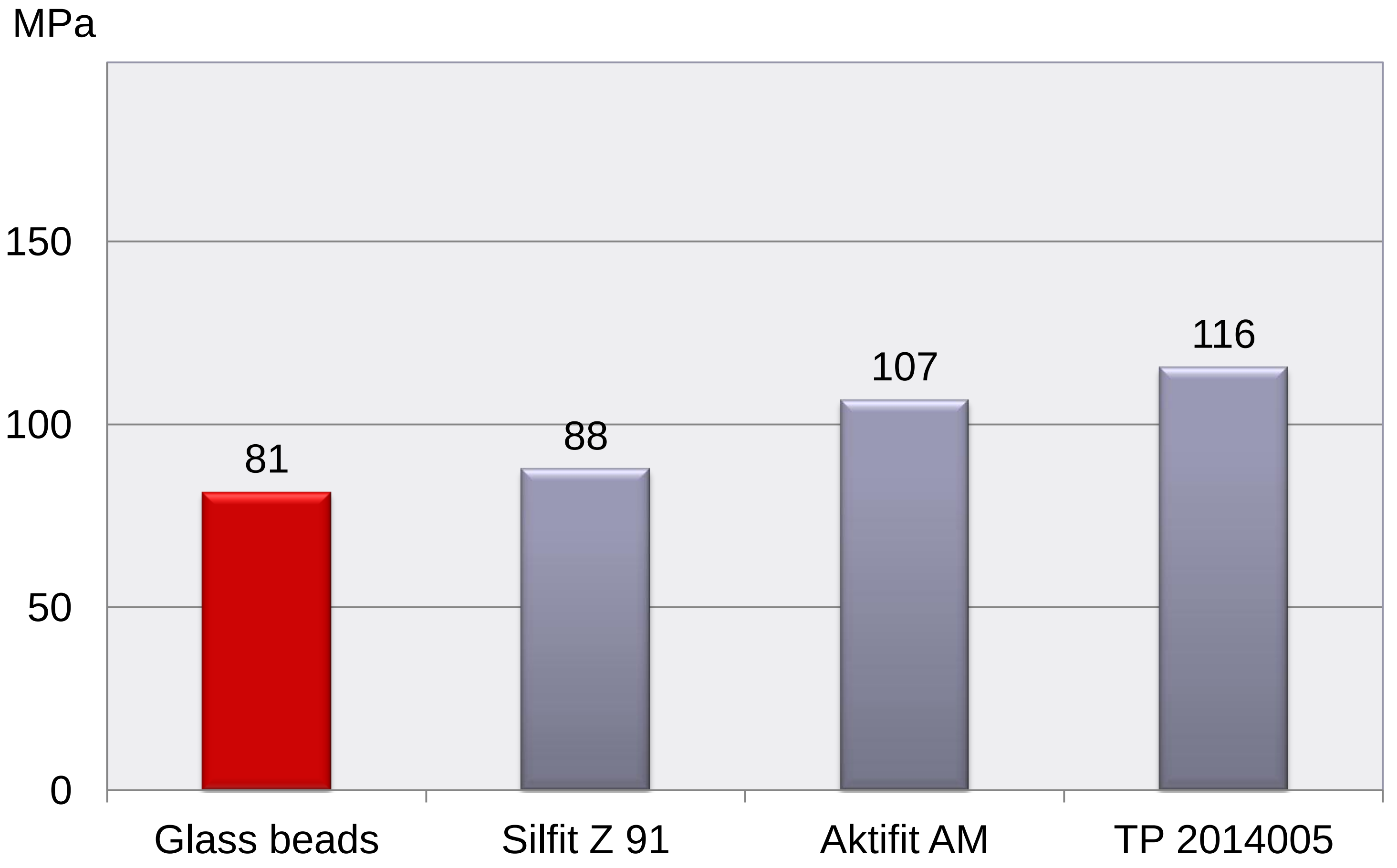
Flexural Modulus

DIN EN ISO 178



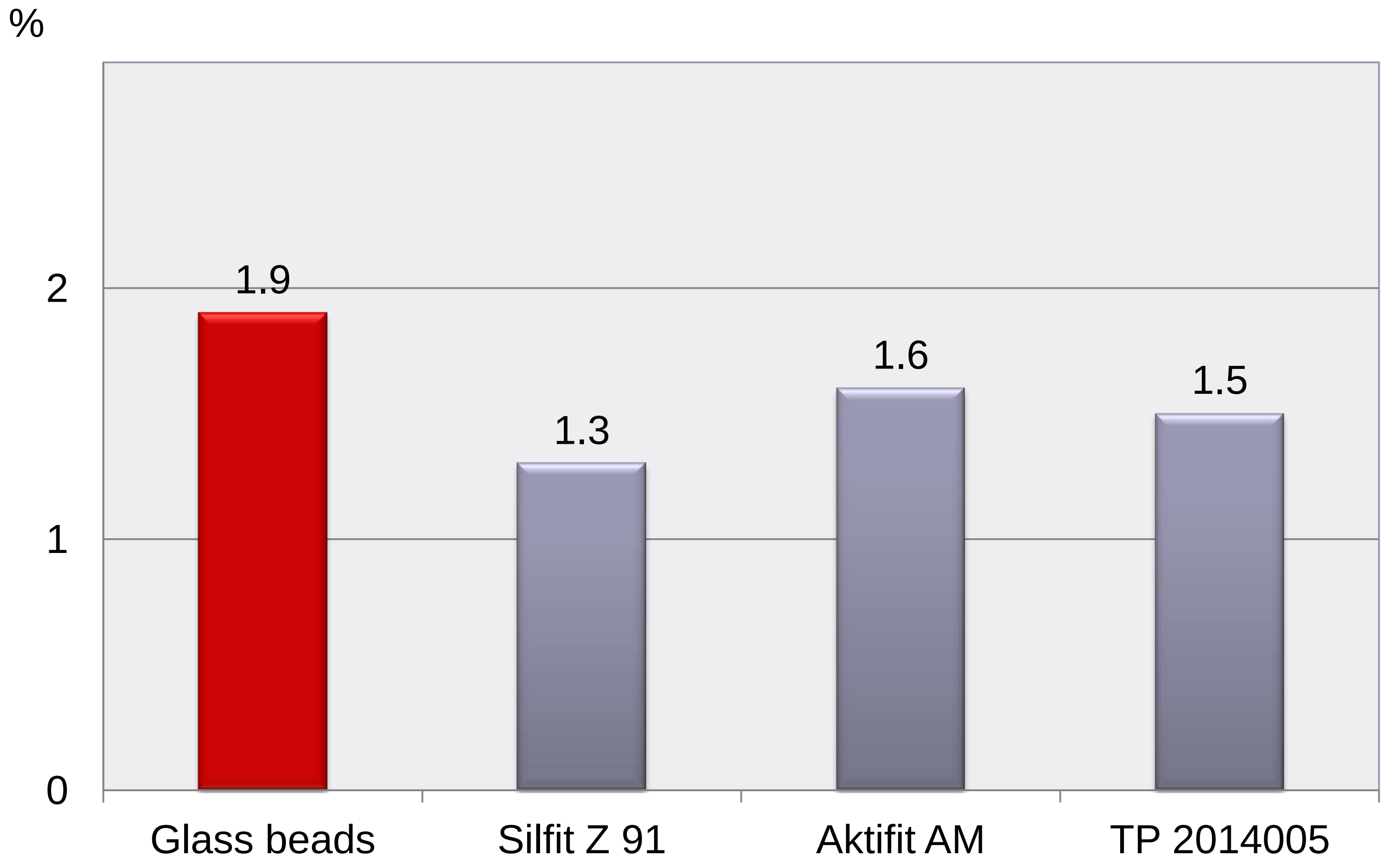
Flexural Strength

DIN EN ISO 178



Flexural Strain at Break

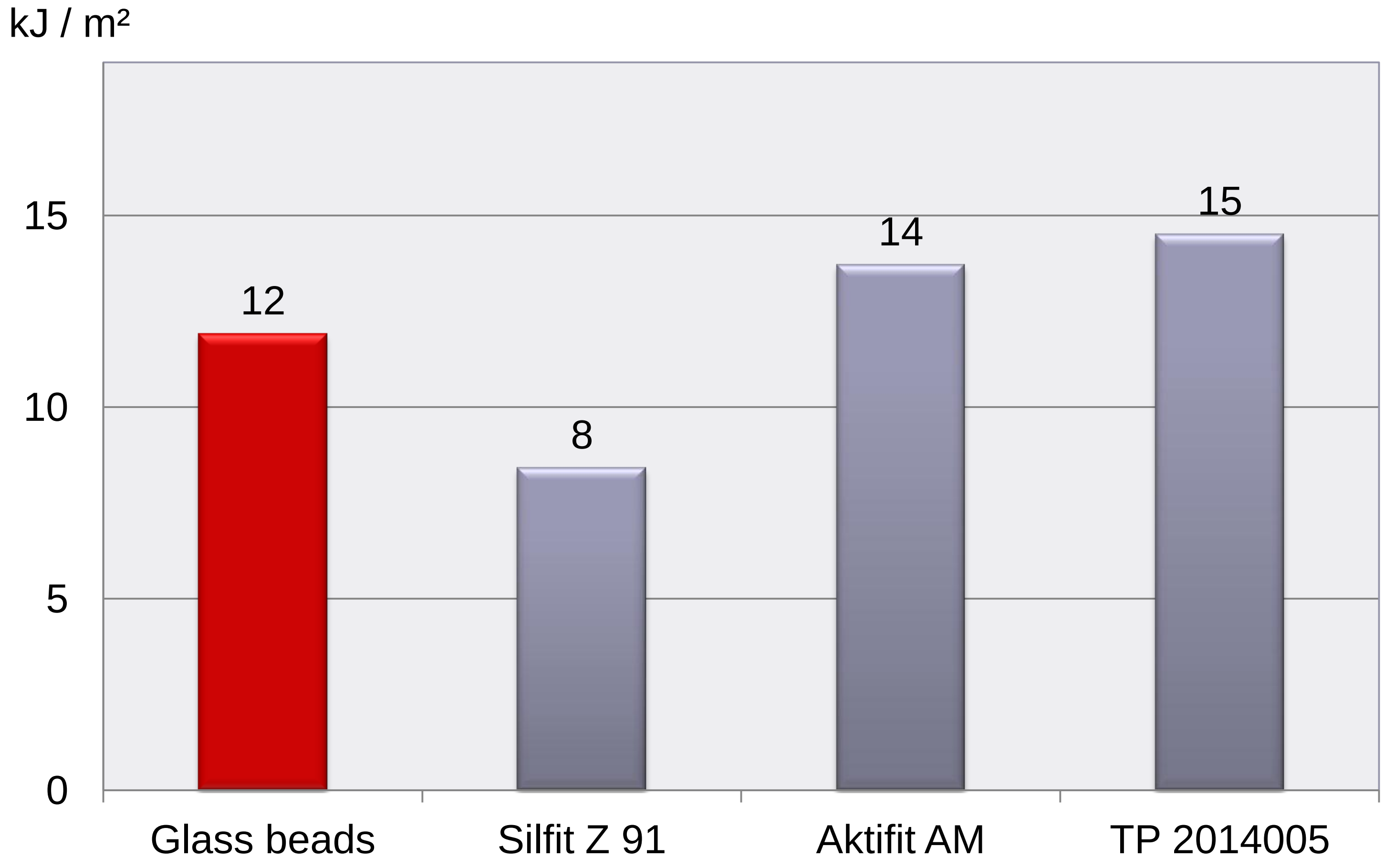
DIN EN ISO 178



Charpy Impact Strength

HOFFMANN MINERAL

DIN EN ISO 179-1/1eU, 23 °C



Color of Compounds

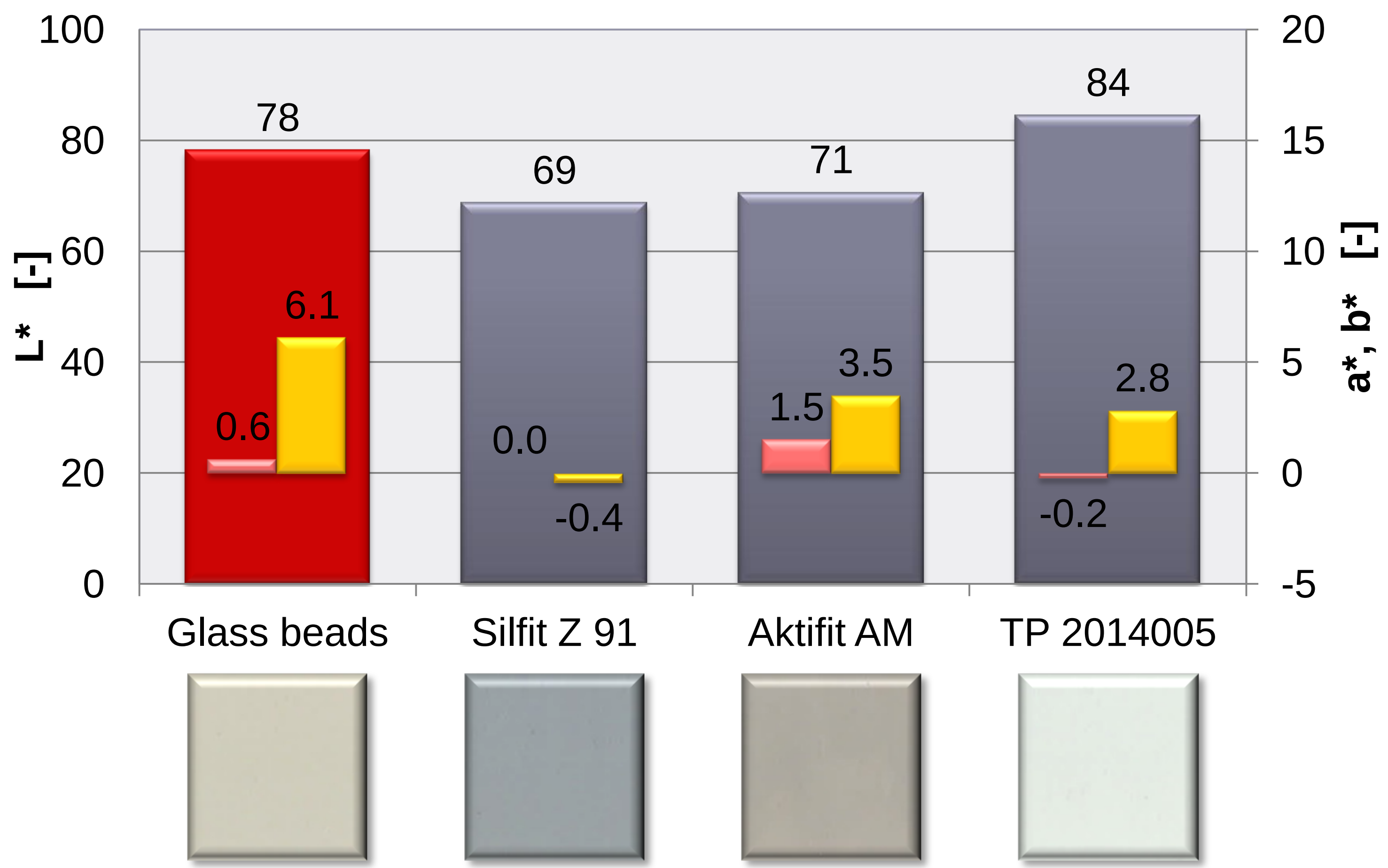
INTRODUCTION

EXPERIMENTAL

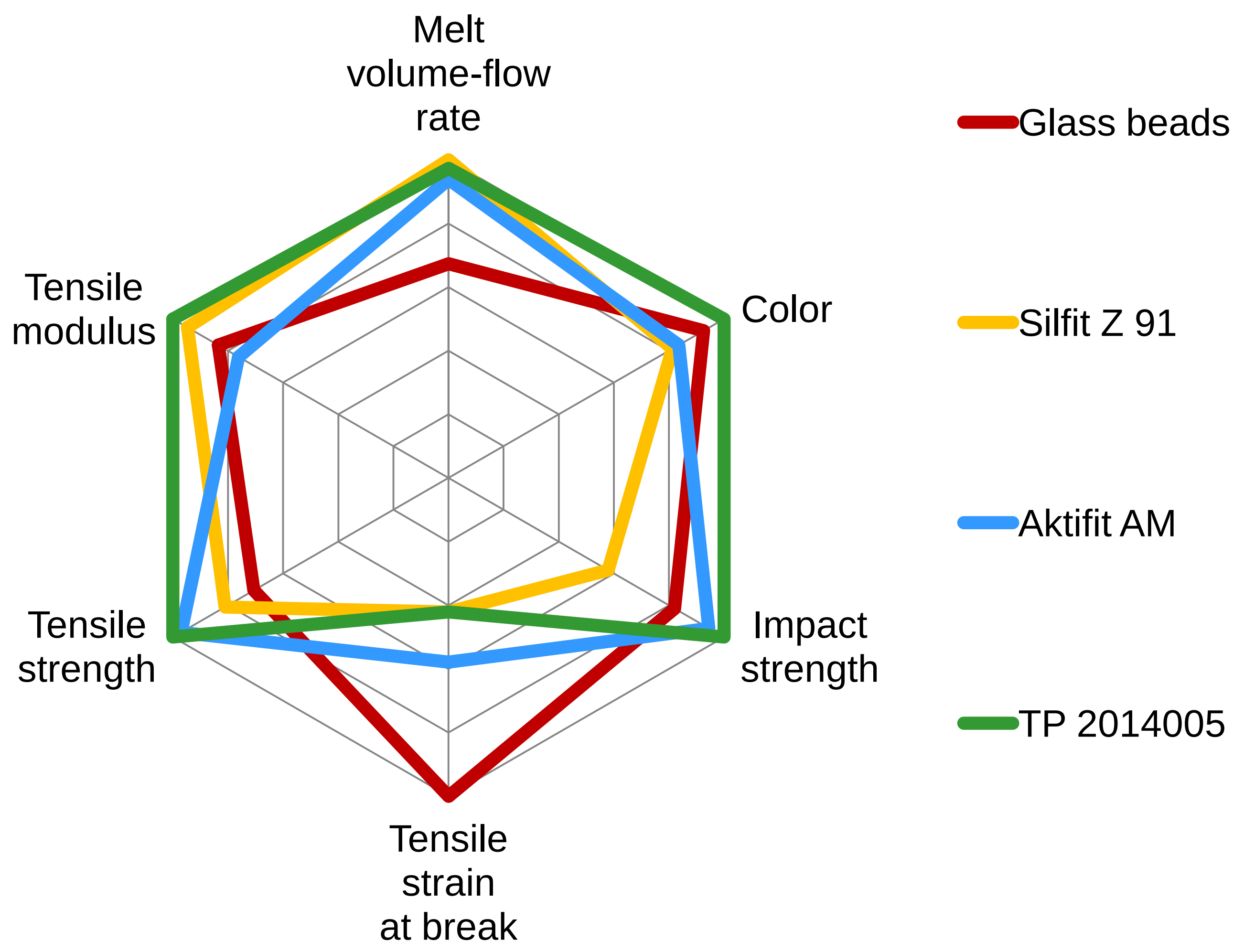
RESULTS

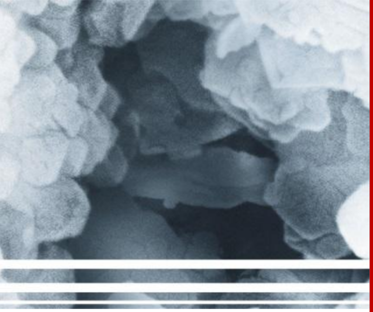
SUMMARY

APPENDIX



Performance PPS





INTRODUCTION
EXPERIMENTAL
RESULTS
SUMMARY
APPENDIX

Summary PPS

HOFFMANN MINERAL

Aktifit AM vs. surface treated glass beads in PPS:

- significant higher melt flow rate
- markedly higher strength at reduced strain at break
- higher impact strength
- lower yellowish tint and higher brightness of the compound

The experimental product **TP 2014005** offers additionally

- higher stiffness
- higher flexural strength
- brighter, almost white color of the compound

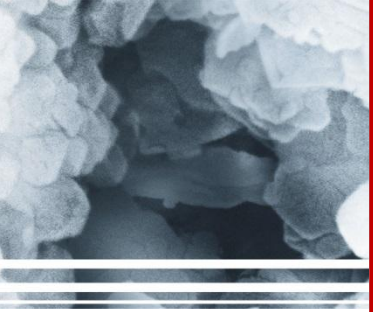
Calcined Neuburg Siliceous Earth in Polybutylene terephthalate (PBT)

Dr. Nicole Strübbe

Author: Petra Zehnder

HOFFMANN MINERAL

We supply material for good ideas



Status Quo

INTRODUCTION

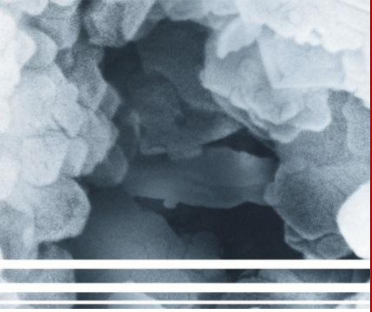
EXPERIMENTAL

RESULTS

SUMMARY

APPENDIX

- PBT is used in a multitude of application areas, above all in the automotive and electrical industries
- Important properties are – apart from easy processing, high strength and stiffness – high dimensional stability, good friction and wear behavior as well as good chemical resistance to many solvents
- For low-warping parts with good surface glass beads are often used to customize properties
- Mineral filled compounds have been hardly available because of their weak property profile



Objective

Assessment of the performance of

Aktifit VM,

a calcined and surface treated Neuburg Siliceous Earth grade,

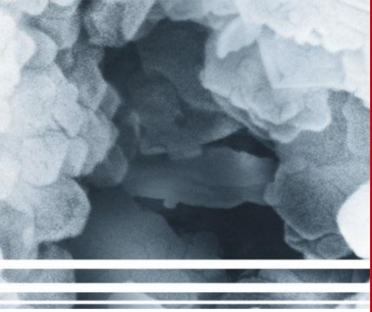
versus

surface treated glass beads in PBT regarding

» Flow

» Heat deflection

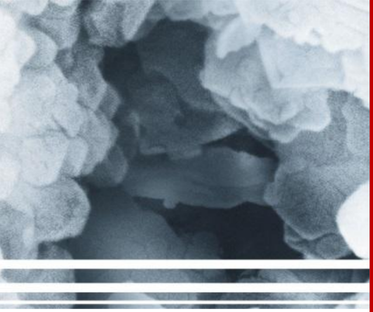
» Mechanical properties
- Tensile test
- Flexural test
- Impact strength



Fillers and Characteristics

HOFFMANN MINERAL

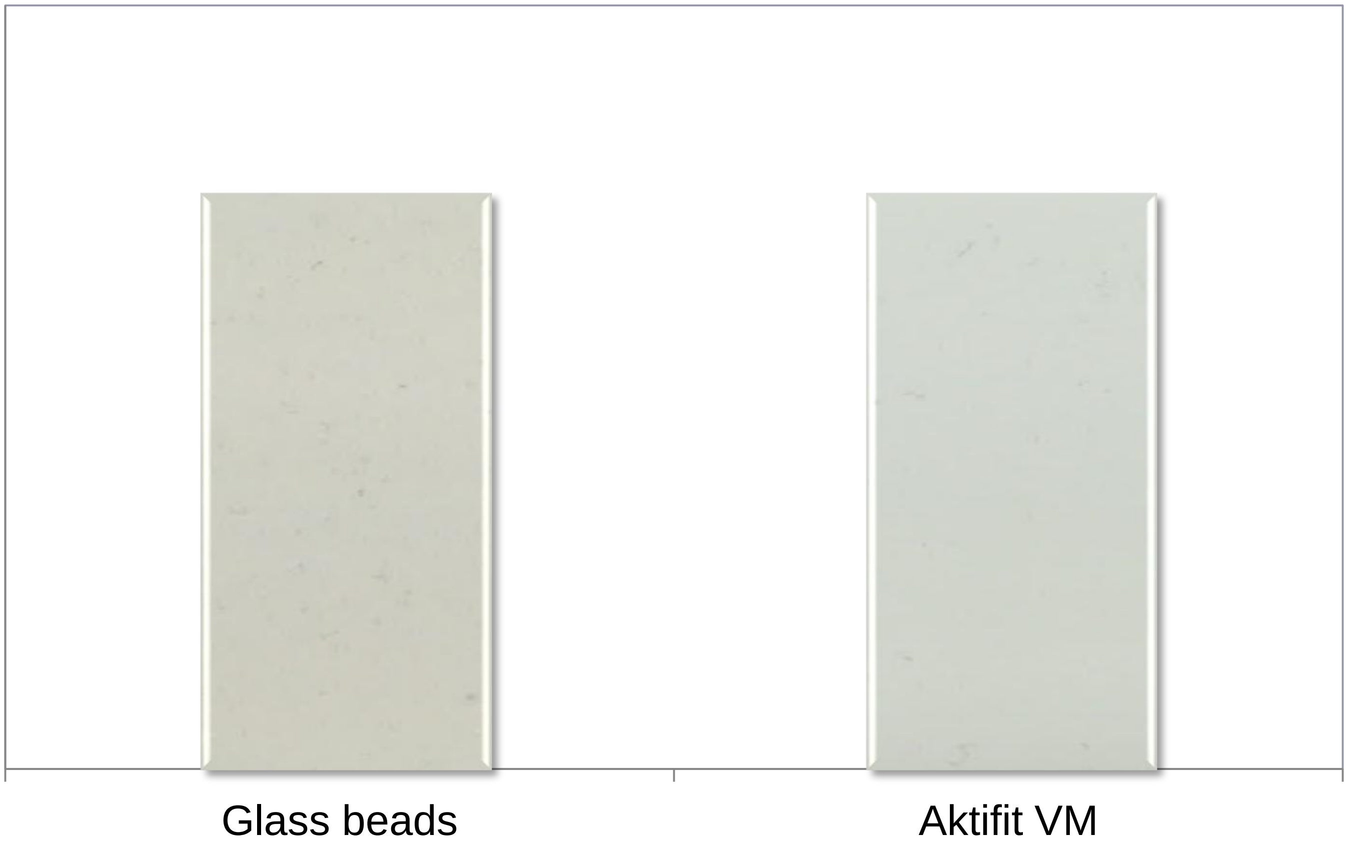
Filler	Description	Surface treatment
Glass beads	d_{50}: 15-30 µm, d_{90}: 30-80 µm	Suitable for PBT
Aktifit VM	Calcined Neuburg Siliceous Earth d_{50}: 2 µm, d_{97}: 10 µm	Vinyl silane



Compounding
Injection Molding

Composition	70 % PBT 30 % Filler
Compounding	Twin screw extruder ZSK 30
Injection molding of test specimens acc. to ISO 1874	Mold acc. to ISO 294 Mold temperature: 80 °C Melt temperature: 260 °C

Color of Specimens



Melt Volume-flow Rate

DIN ISO 1133; 250 °C, 2.16 kg

Heat Deflection
Heat Distortion Temperature

DIN EN ISO 75-1, -2; Method Af (1.8 MPa)

INTRODUCTION

EXPERIMENTAL

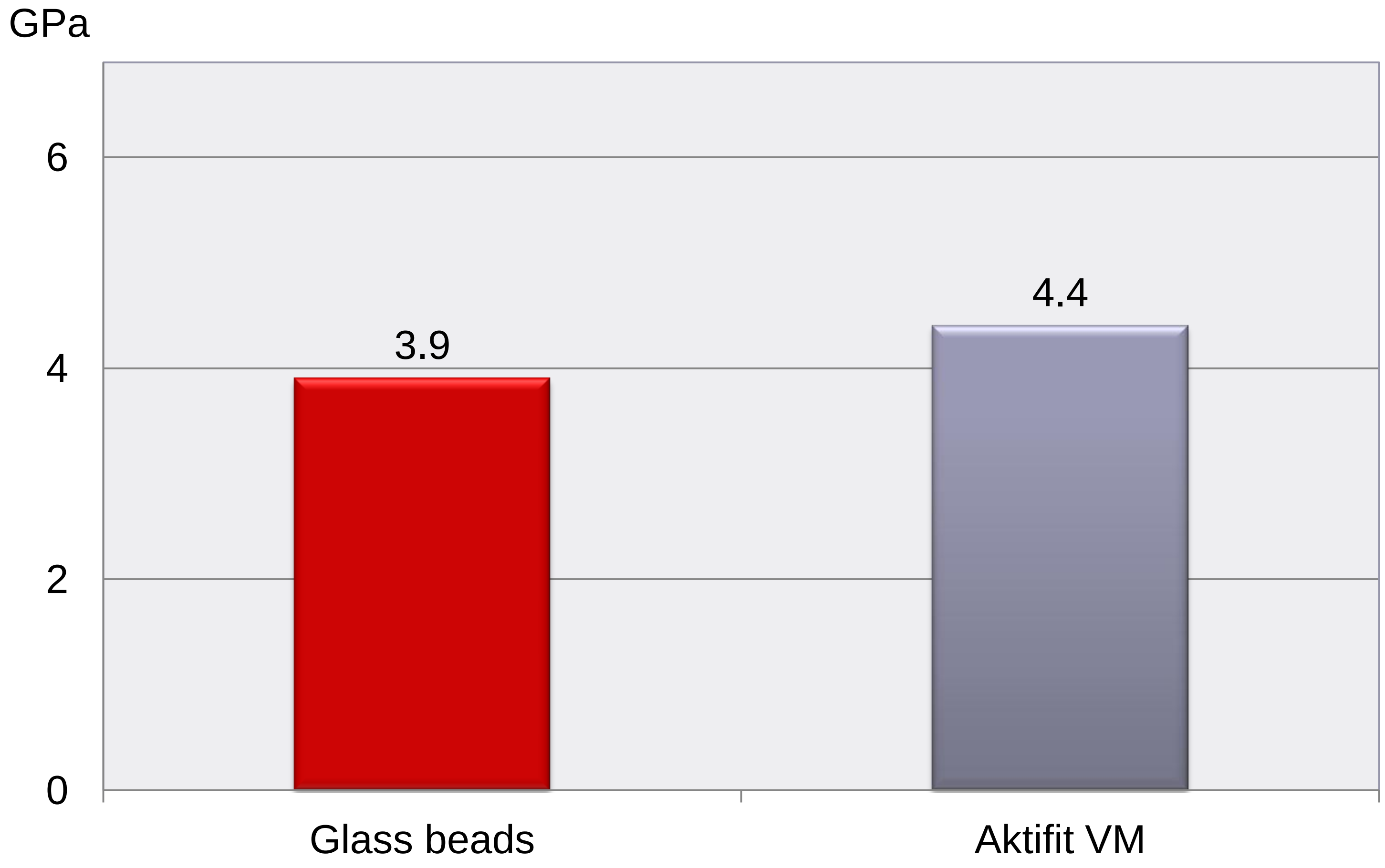
RESULTS

SUMMARY

APPENDIX

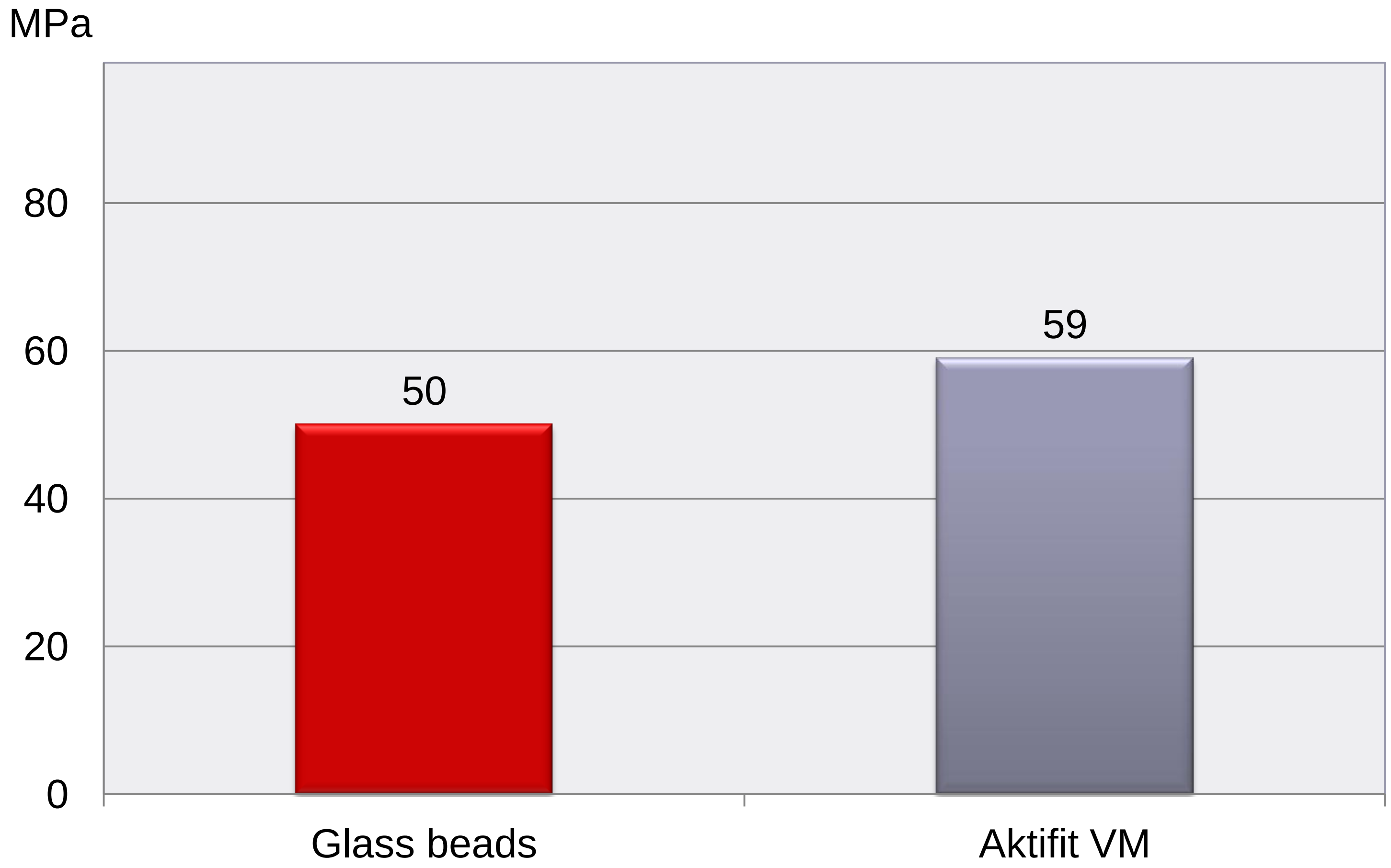
Tensile Modulus

DIN EN ISO 527-1,-2; 1 mm/min



Tensile Strength

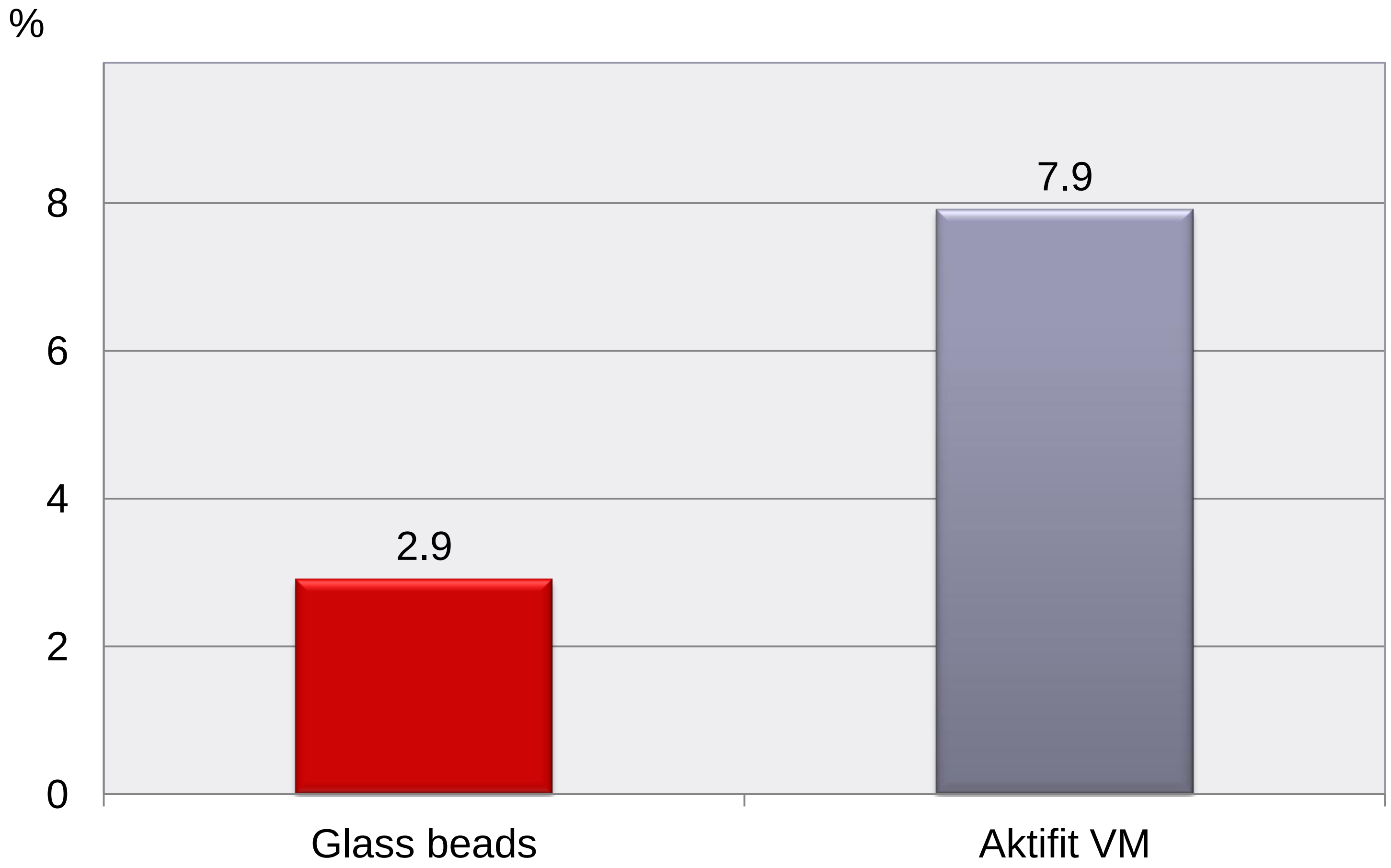
DIN EN ISO 527-1,-2; 5 mm/min



Tensile Strain at Break

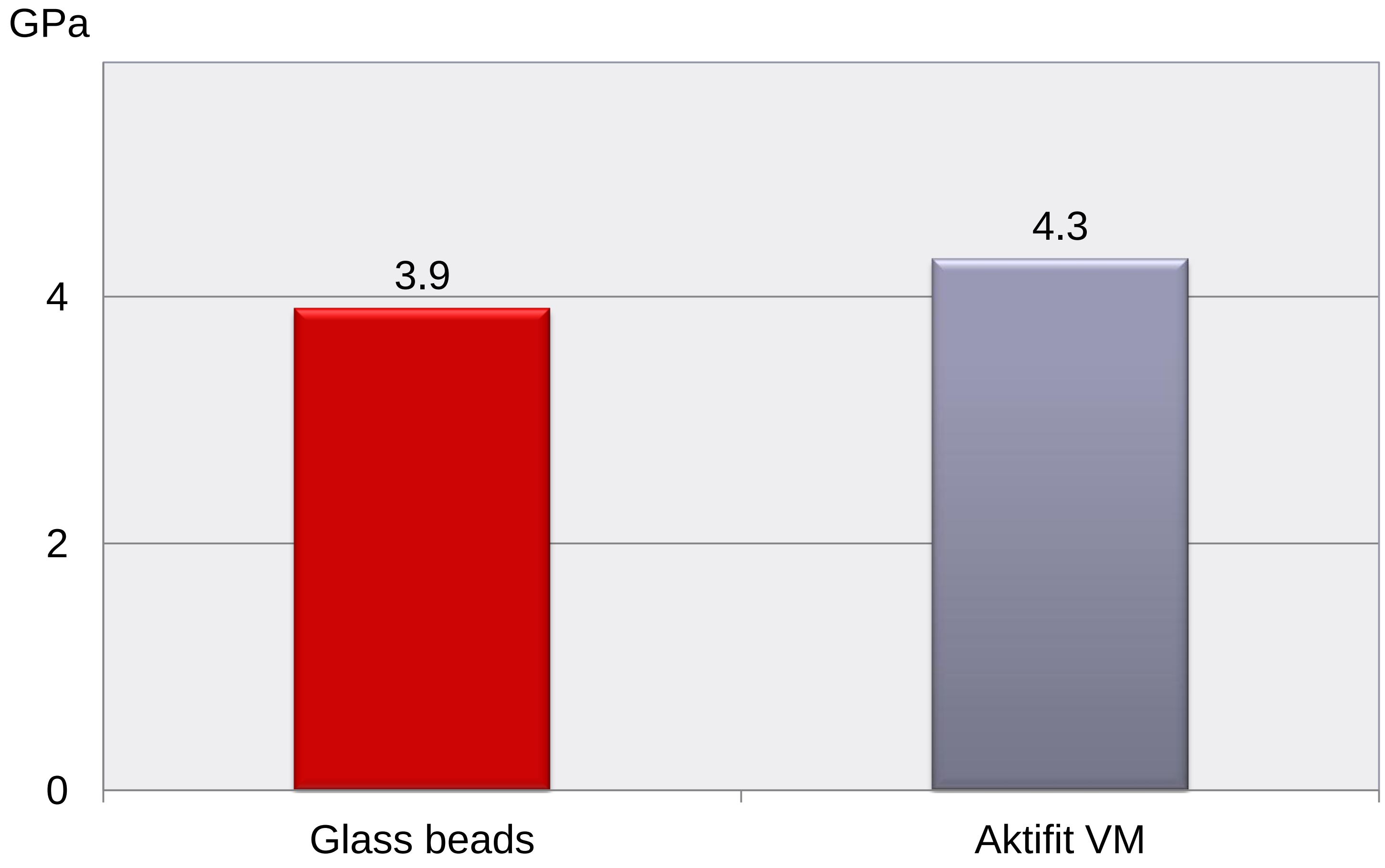
HOFFMANN MINERAL

DIN EN ISO 527-1,-2; 5 mm/min



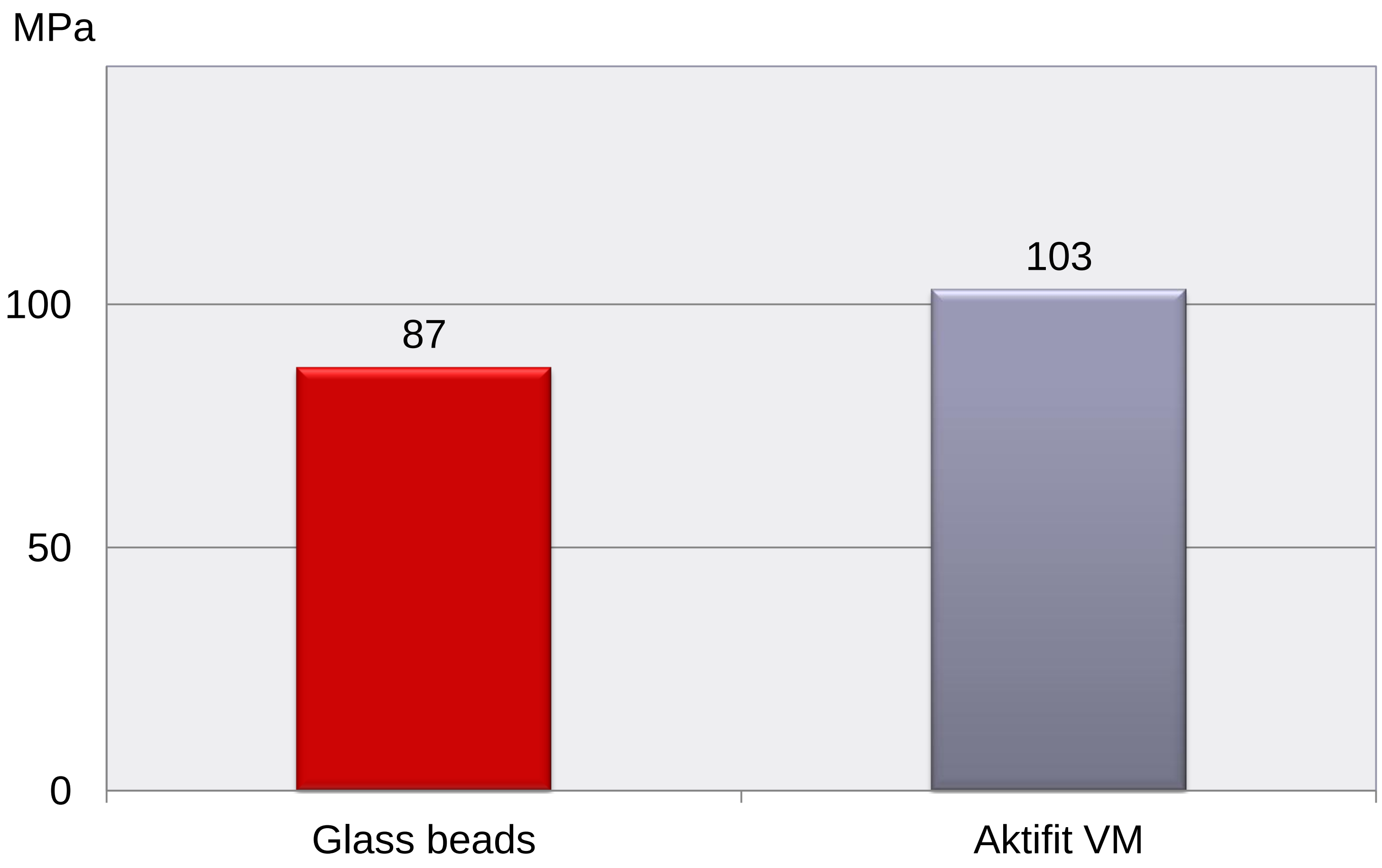
Flexural Modulus

DIN EN ISO 178



Flexural Strength

DIN EN ISO 178



Flexural Strain at Break

INTRODUCTION

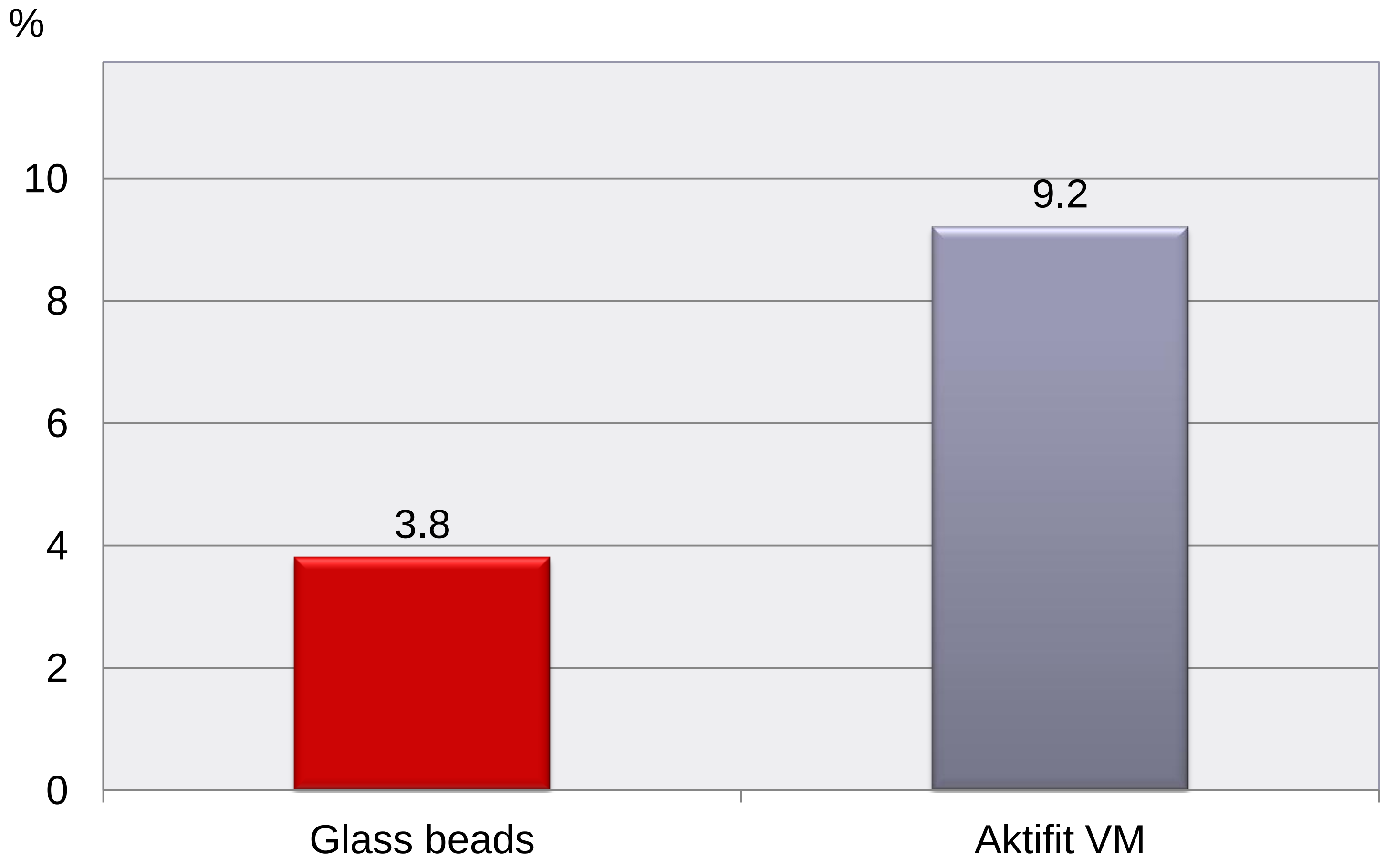
EXPERIMENTAL

RESULTS

SUMMARY

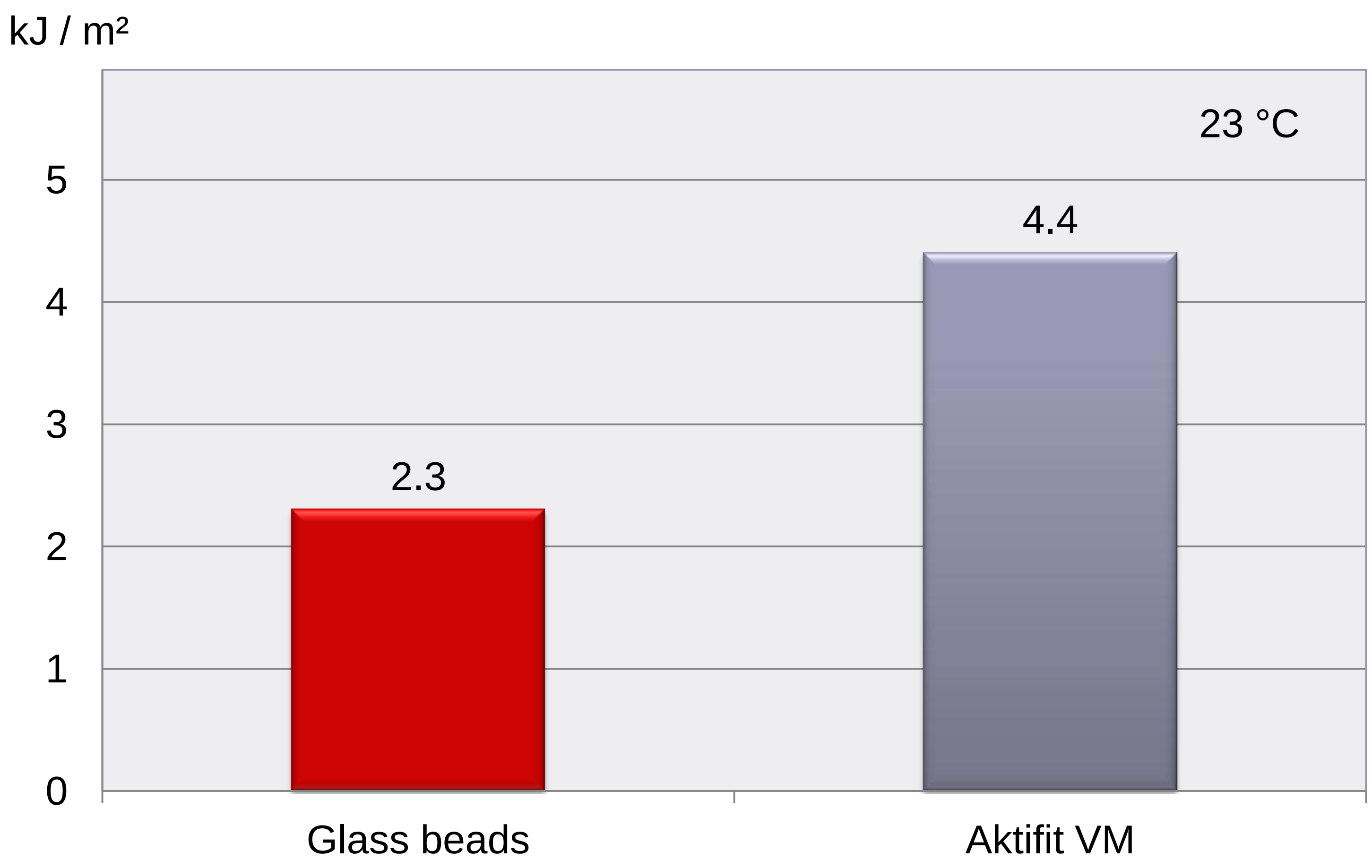
APPENDIX

DIN EN ISO 178

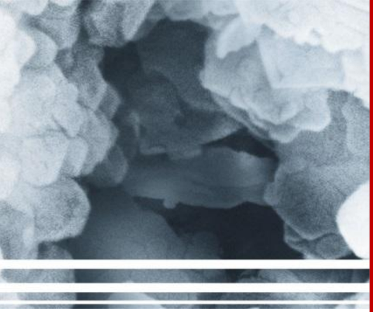


Charpy
Notched Impact Strength

DIN EN ISO 179-1/1eA



Charpy
Notched Impact Strength



INTRODUCTION

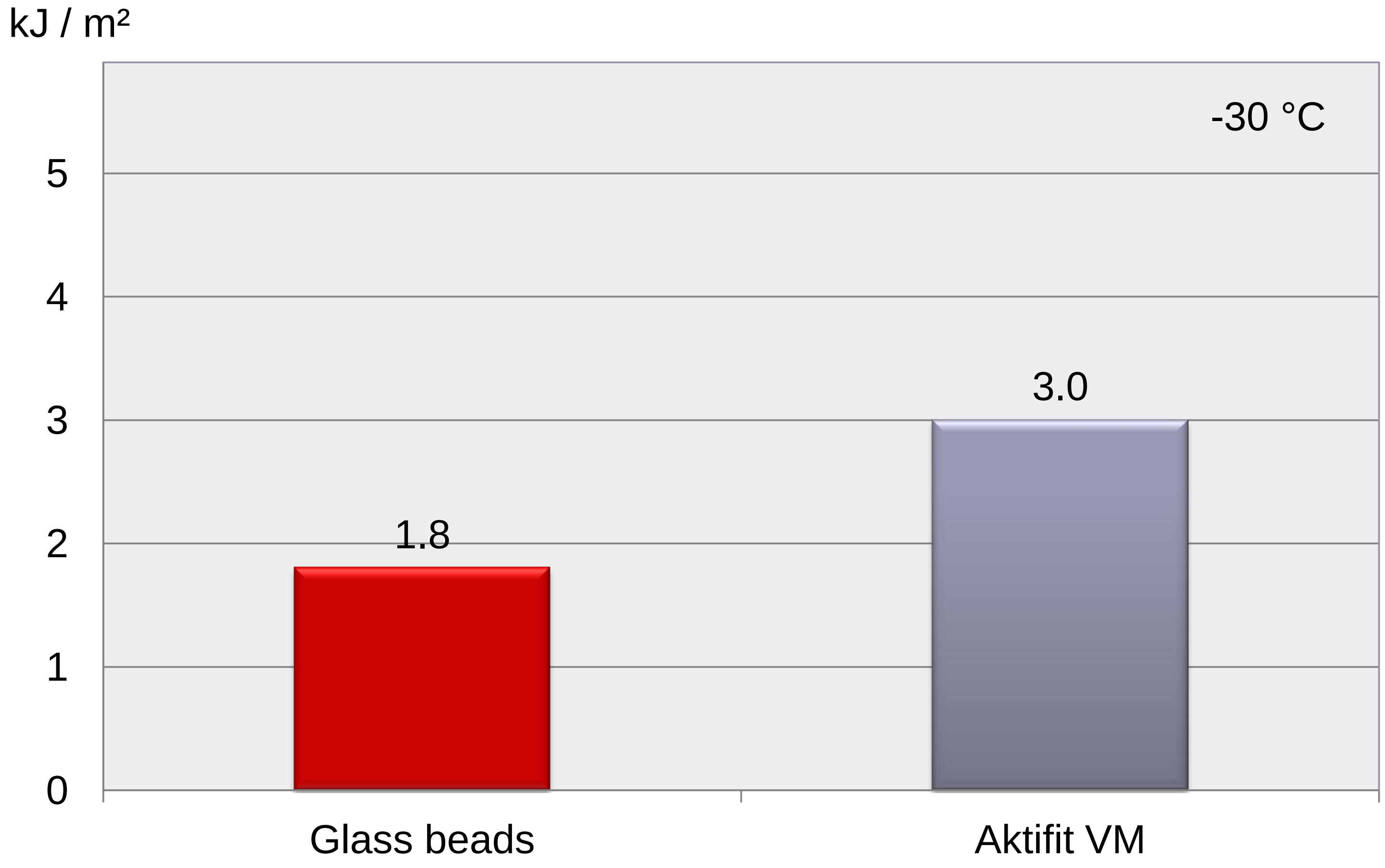
EXPERIMENTAL

RESULTS

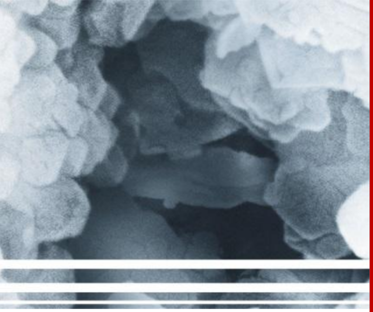
SUMMARY

APPENDIX

DIN EN ISO 179-1/1eA



Charpy Impact Strength



INTRODUCTION

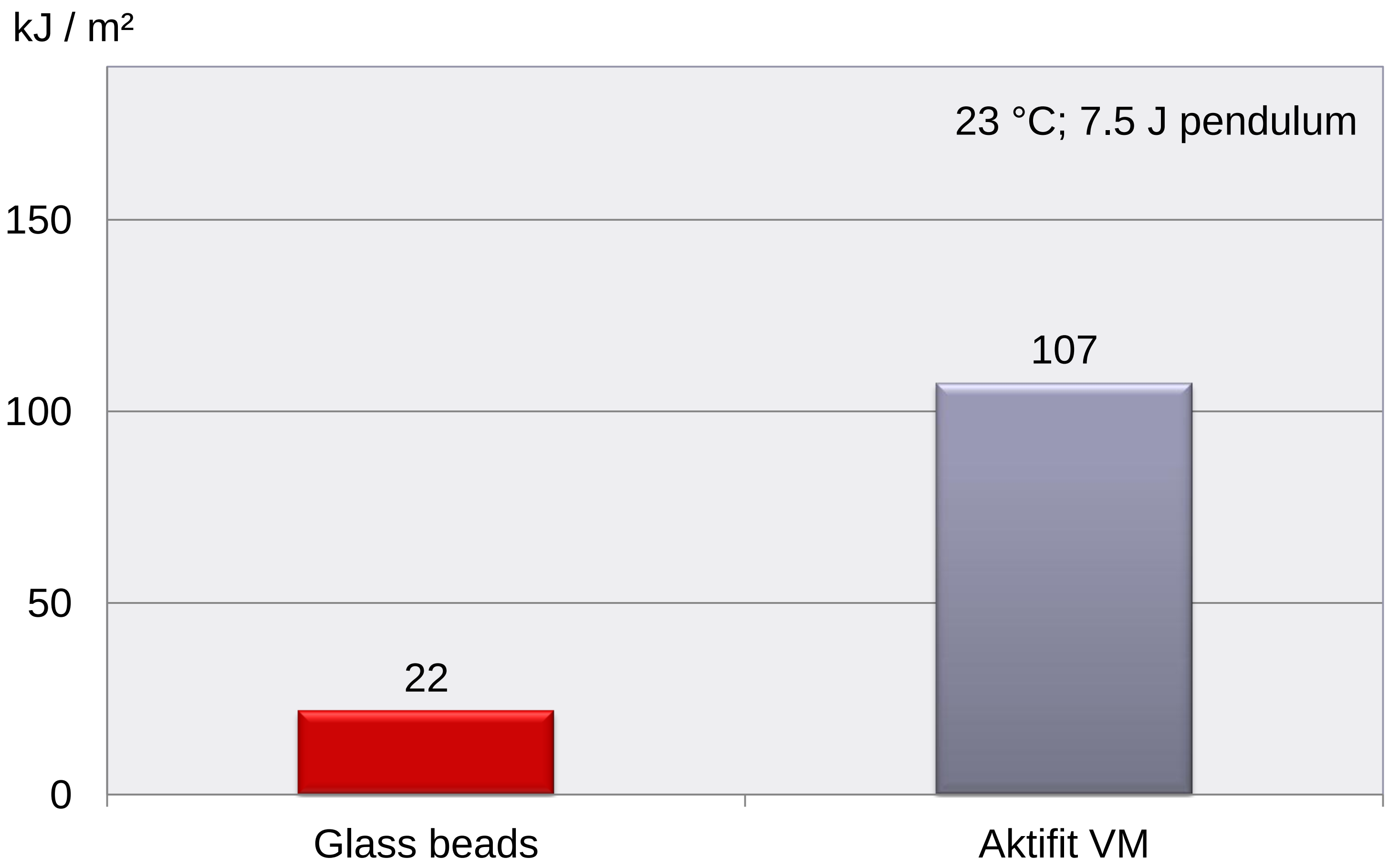
EXPERIMENTAL

RESULTS

SUMMARY

APPENDIX

DIN EN ISO 179-1/1eU

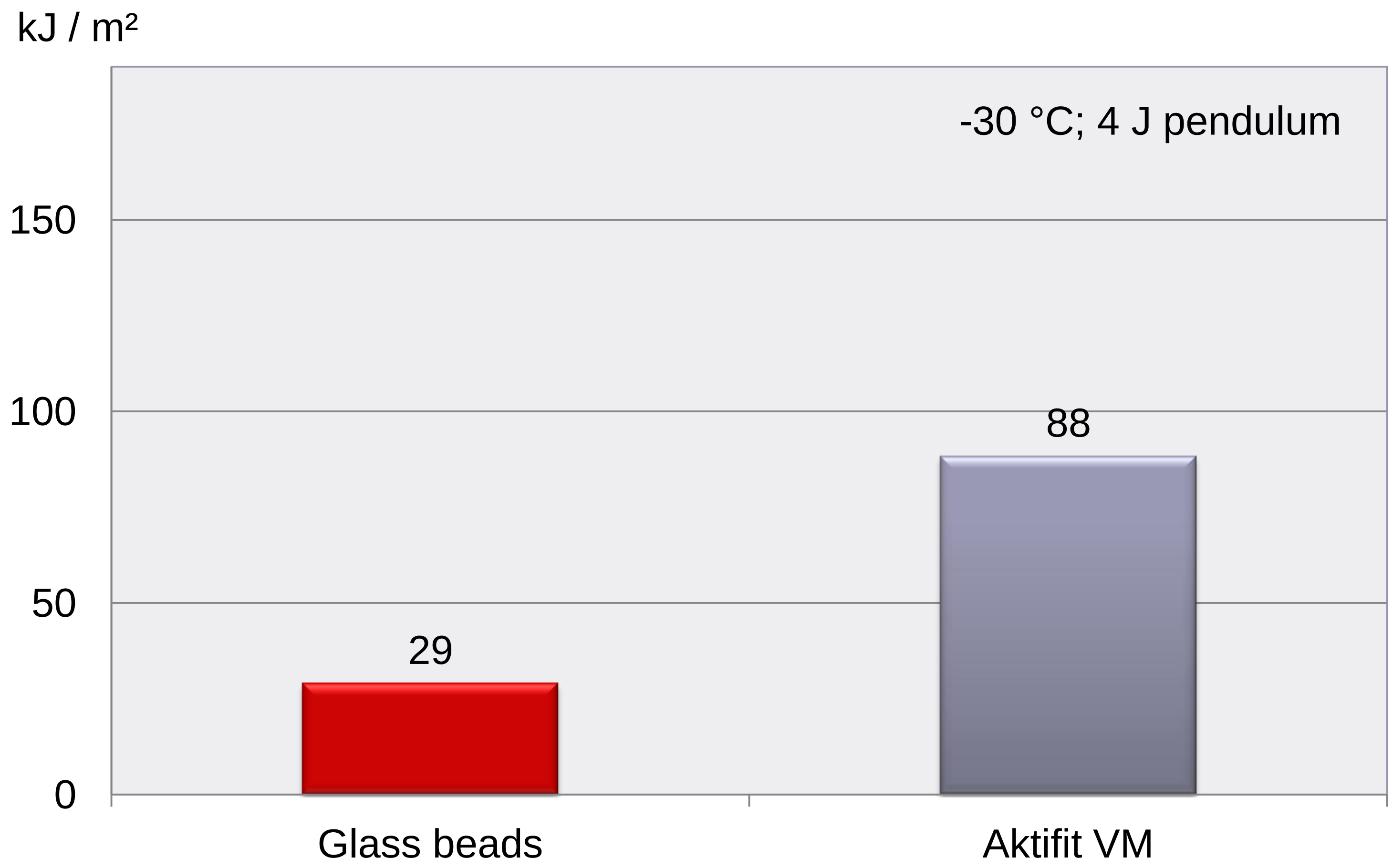


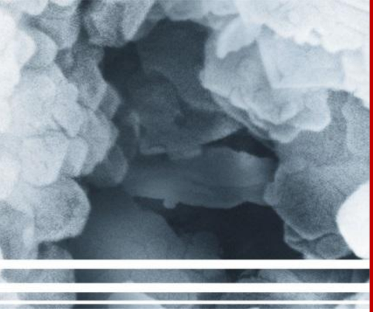
Charpy Impact Strength

HOFFMANN MINERAL

- INTRODUCTION
- EXPERIMENTAL
- RESULTS
- SUMMARY
- APPENDIX

DIN EN ISO 179-1/1eU





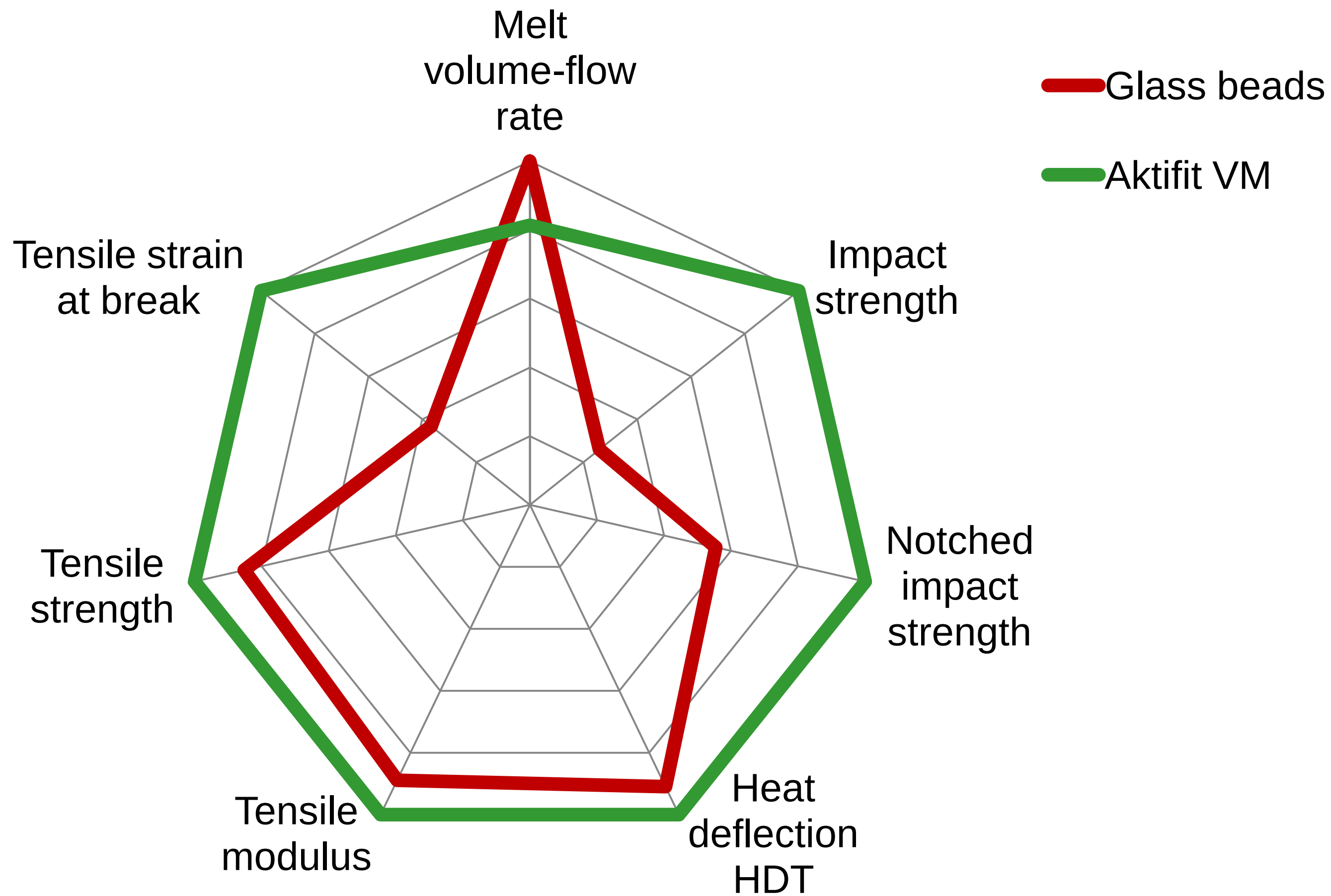
Black Compounds

Coloring the compounds with carbon black often causes a loss of mechanical properties.

Aktifit VM was therefore also compounded in combination with a black color batch.

Aktifit VM reached results approximately comparable to the natural-colored compound, no significant difference was noted.

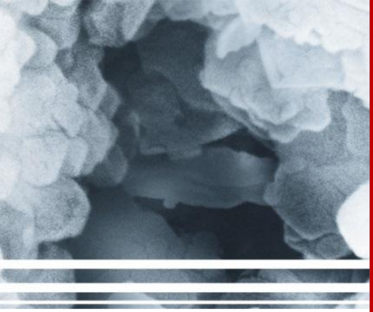
Performance PBT



Summary PBT

Aktifit VM vs. surface treated glass beads in PBT:

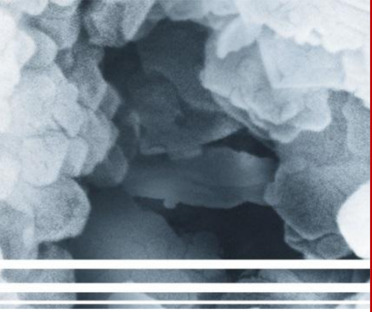
- Somewhat lower melt flow rate
- Higher heat deflection temperature
- Higher stiffness
- Higher strength
- Very high strain at break
- Excellent impact strength, even at low-temperature



Additional Information: CSE vs. Glass fibers

CSE vs. surface treated glass fibers in PBT and PPS:

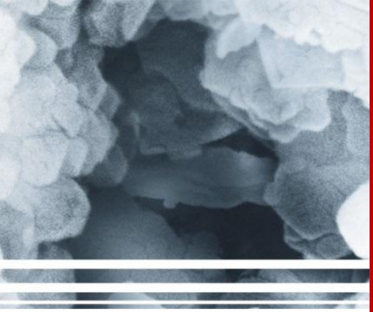
- Generally higher filler loadings and therefore lower overall compound costs
- Lower warping with good surface
- Higher impact strength in PBT
- Higher strain at break in PBT



Thank you very much for your attention!

HOFFMANN MINERAL GmbH • P.O.Box 14 60 • D-86619 Neuburg (Donau)
Phone +49 (0) 8431-53-0 • Fax +49 (0) 8431-53-3 30
Internet: www.hoffmann-mineral.com • e-Mail: info@hoffmann-mineral.com

Our applications engineering advice and the information contained in this memorandum are based on experience and are made to the best of our knowledge and belief, they must be regarded however as non-binding advice without guarantee. Working and employment conditions over which we have no control exclude any damage claim arising from the use of our data and recommendations. Furthermore we cannot assume any responsibility for patent infringements, which might result from the use of our information.



Contents