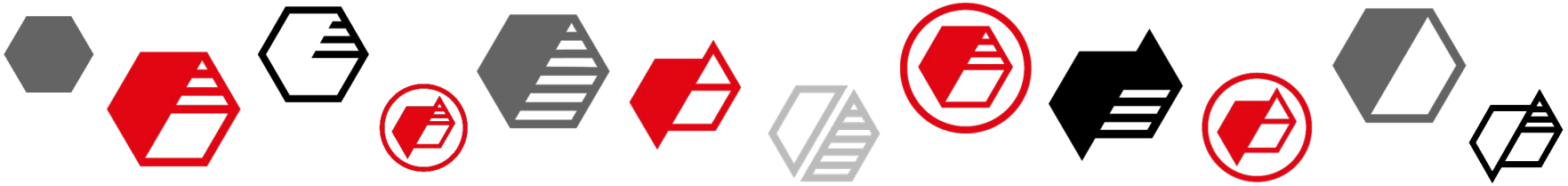

# Calcined Neuburg Siliceous Earth in polyphenylene sulfide (PPS)

**Author: Petra Zehnder**

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# Contents

- Introduction
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# Status Quo



- 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

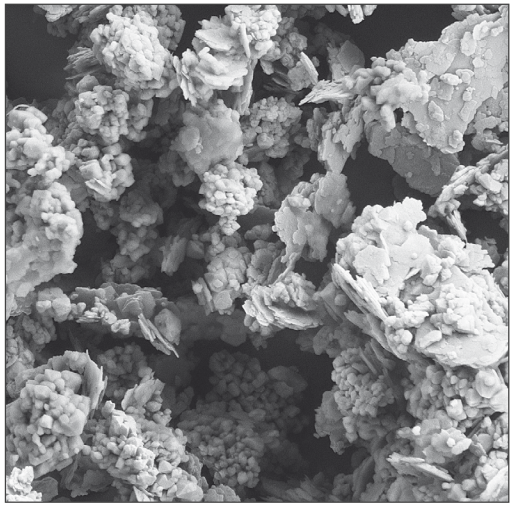
- Tensile test
- Flexural test
- Impact strength

» Color of compounds

# Calcined Neuburg Siliceous Earth

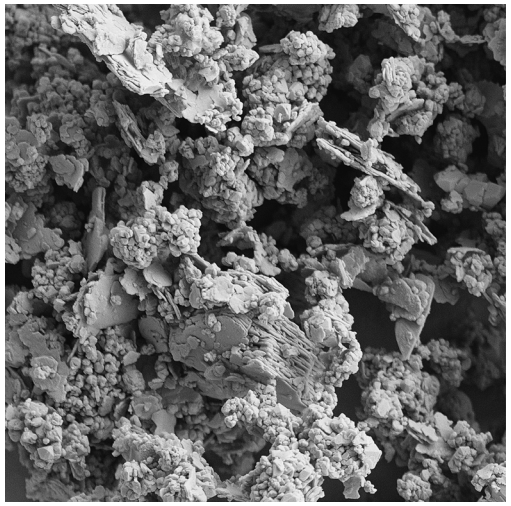


A downstream thermal process leads to the calcined products Silfit and Aktifit, based on SILLITIN Z 86.



Neuburg Siliceous Earth

**Calcination Process**



Calcined Neuburg Siliceous Earth

Additional application benefits, as well as the removing of crystal water included in the kaolinite. The silica part remains inert.

# Fillers and Characteristics



| Filler | Description | Functionali-zation |
|---|---|---|
| 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 |
| Aktifit PF 115 | Basis: Silfit Z 91 | Amino |

# Compounding
# Injection Molding

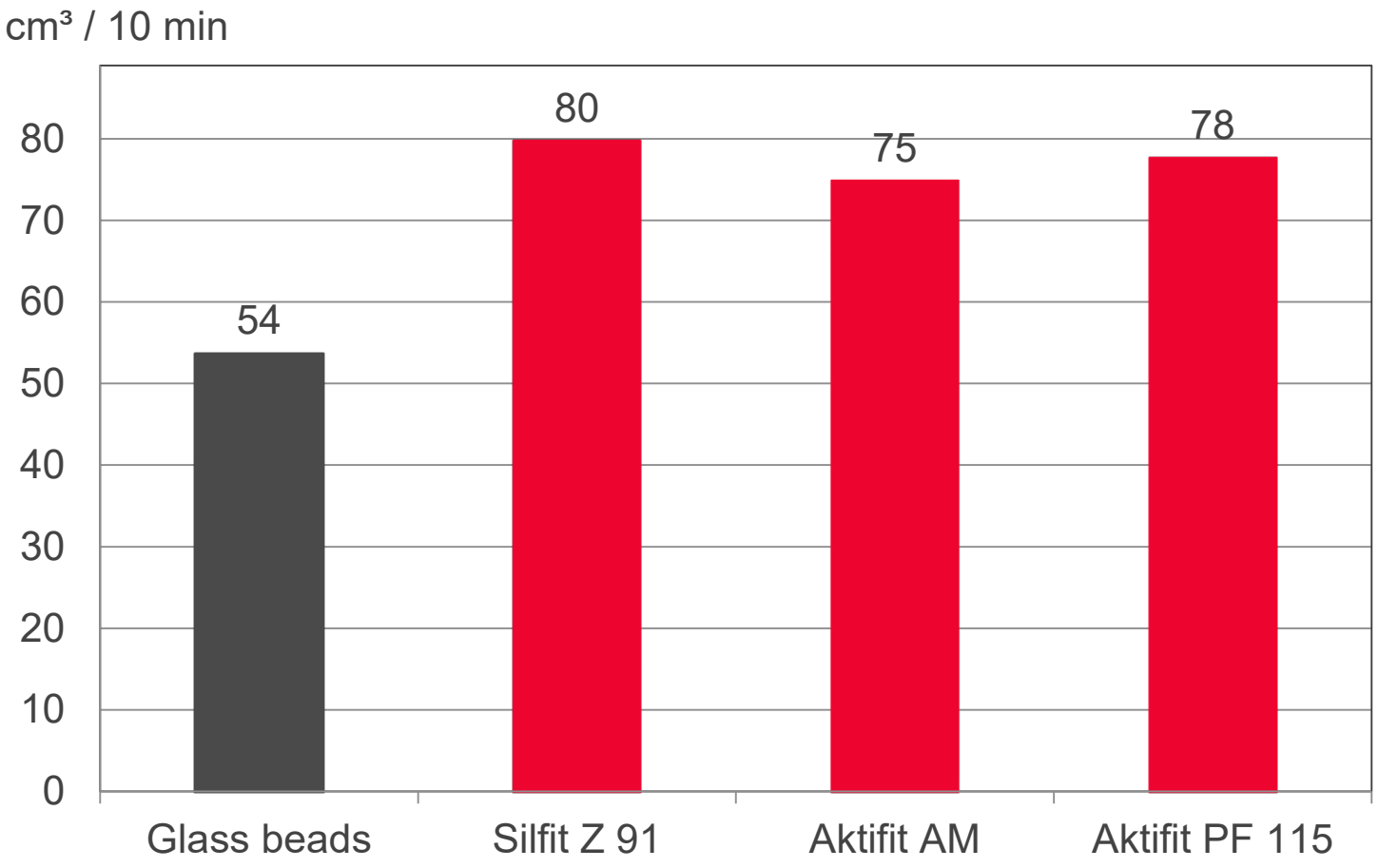


| | |
|---|---|
| Composition | 60 % PPS<br>40 % Filler |
| Compounding | Twin screw extruder ZSK 30 |
| Injection molding of test specimens acc. to ISO 1874 | Mold acc. to ISO 294<br>Mold temperature: 150 °C<br>Melt temperature: 315 °C |

# Melt Volume-flow Rate

DIN ISO 1133; 300 °C, 5 kg

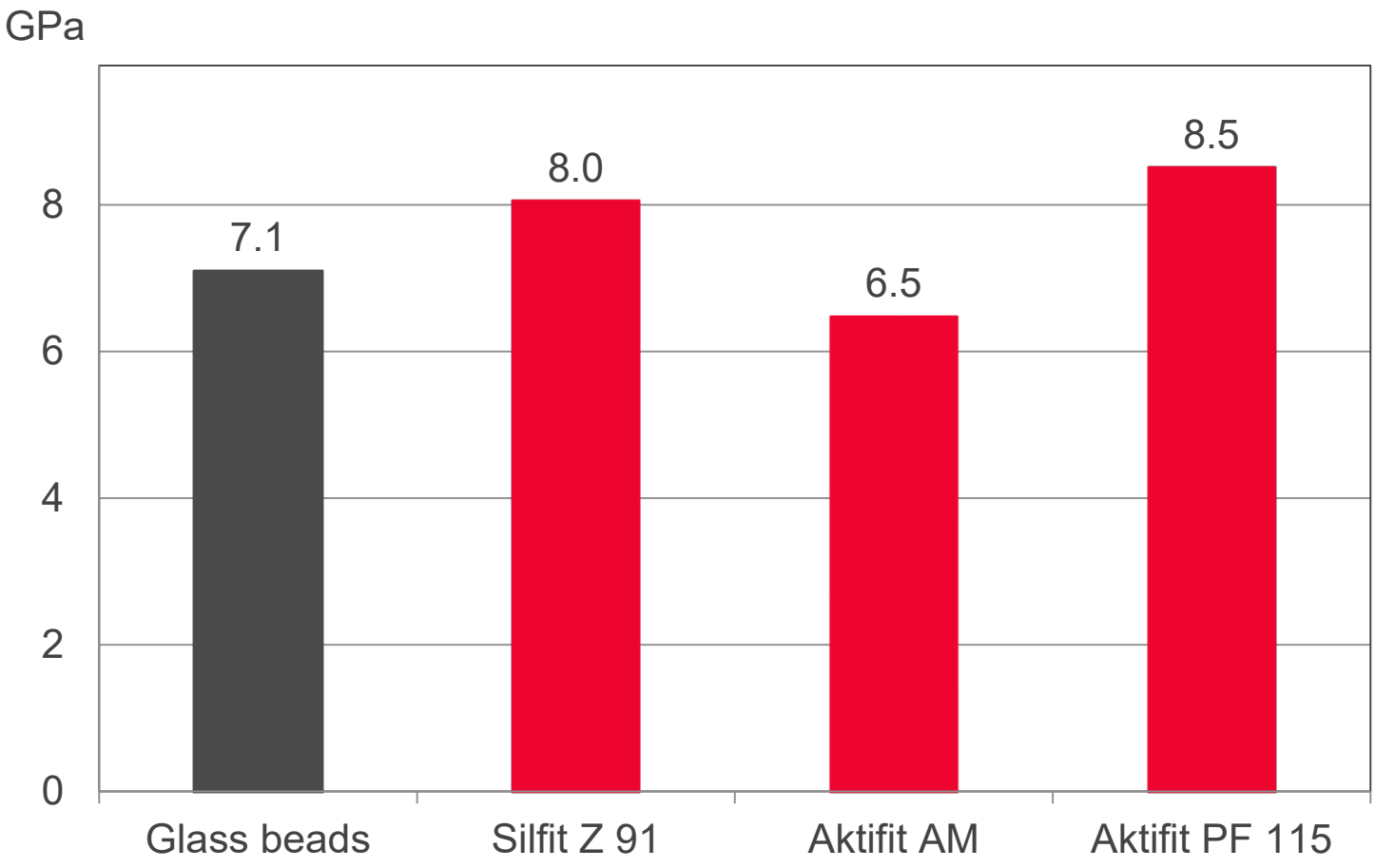




# Tensile Modulus

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

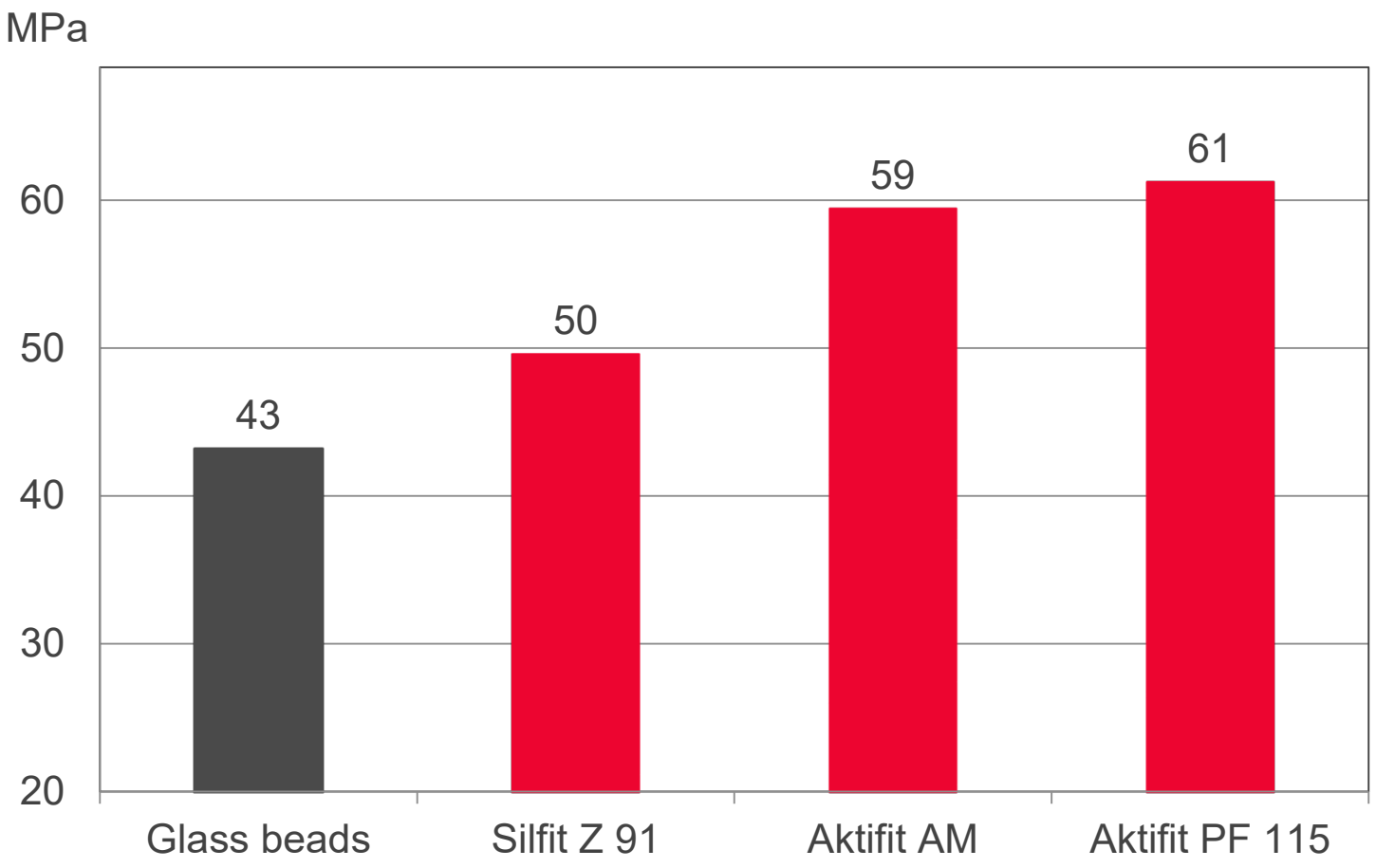




# Tensile Strength



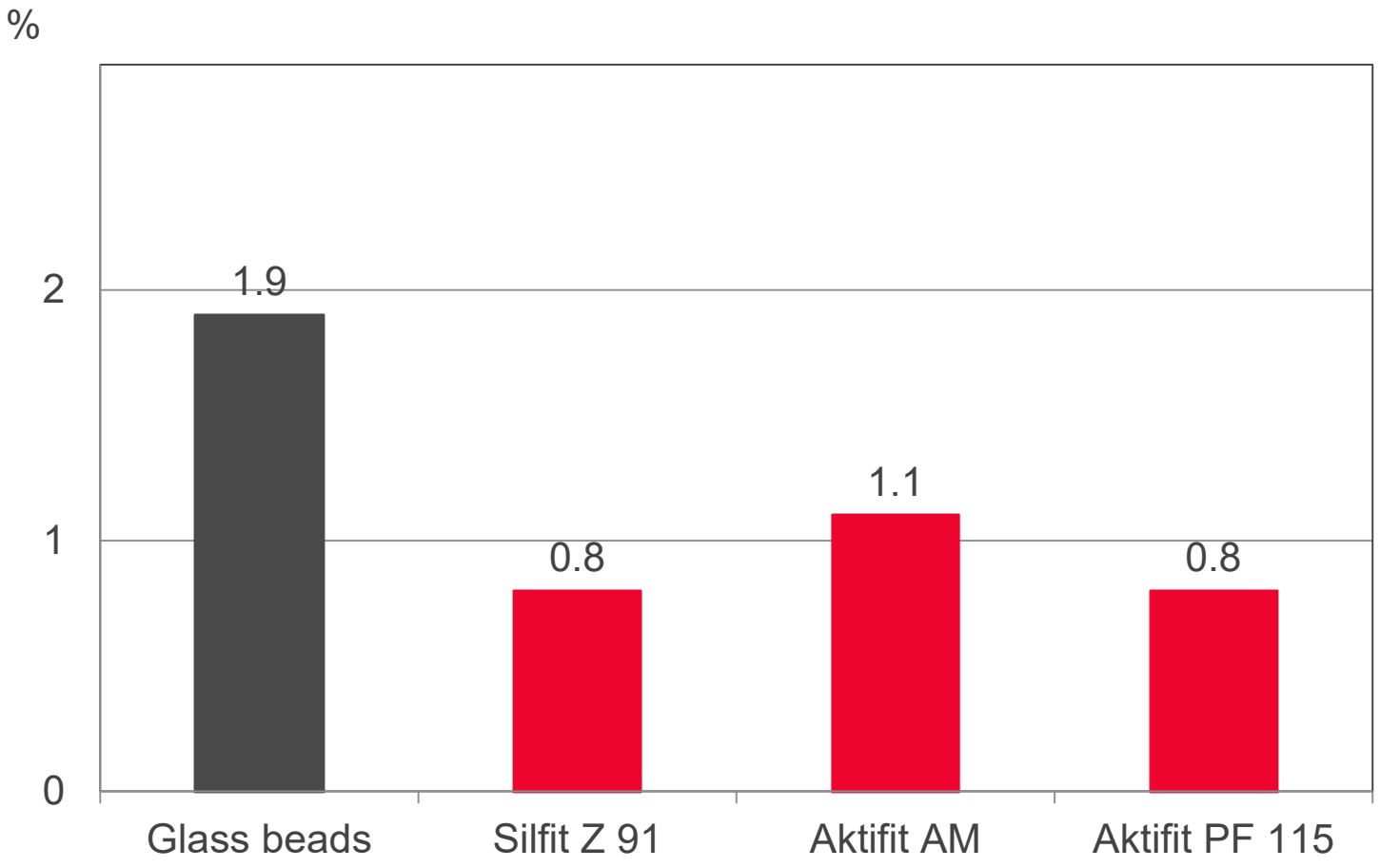
DIN EN ISO 527-1,-2; 5 mm/min



# Tensile Strain at Break

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

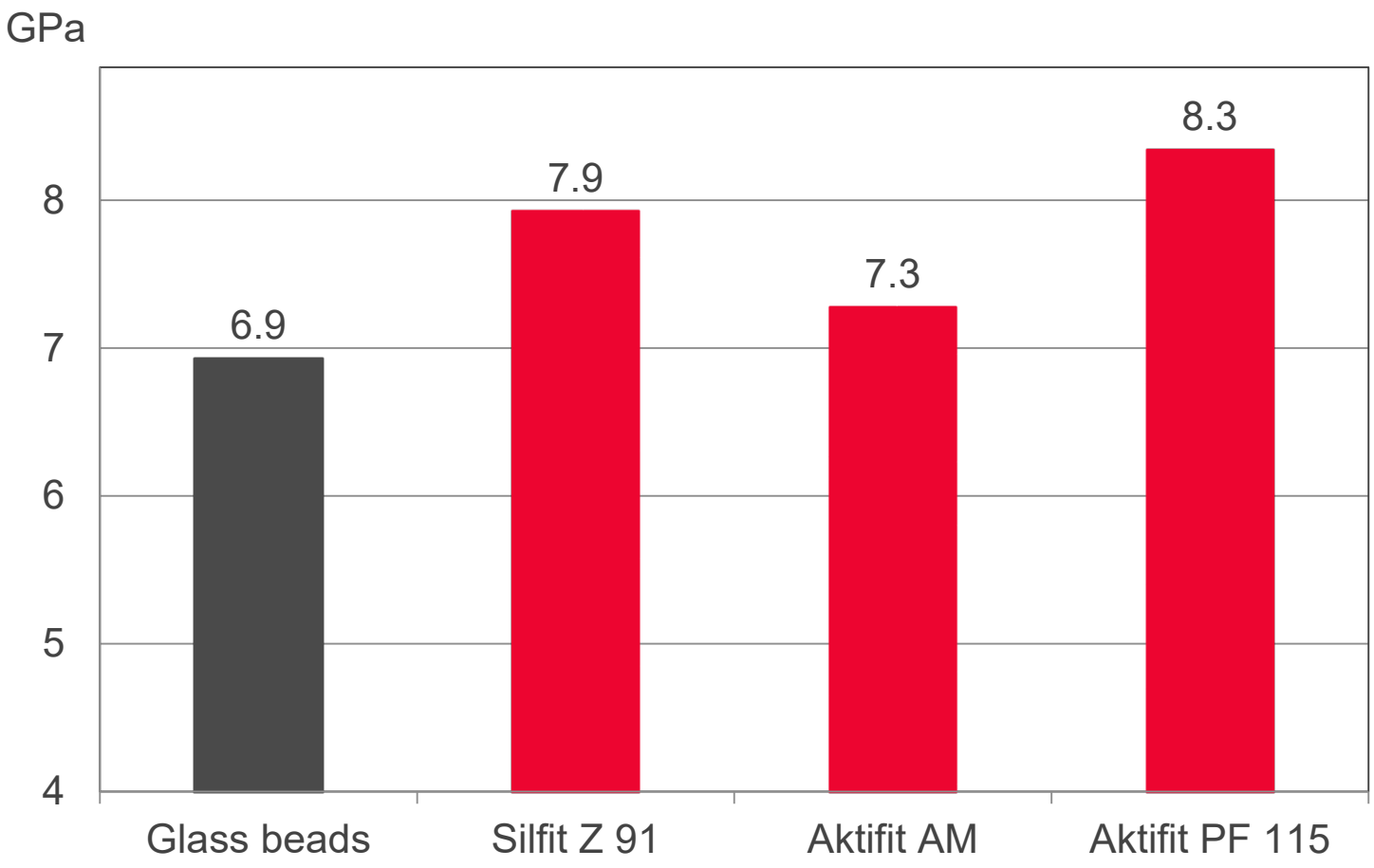




# Flexural Modulus

DIN EN ISO 178

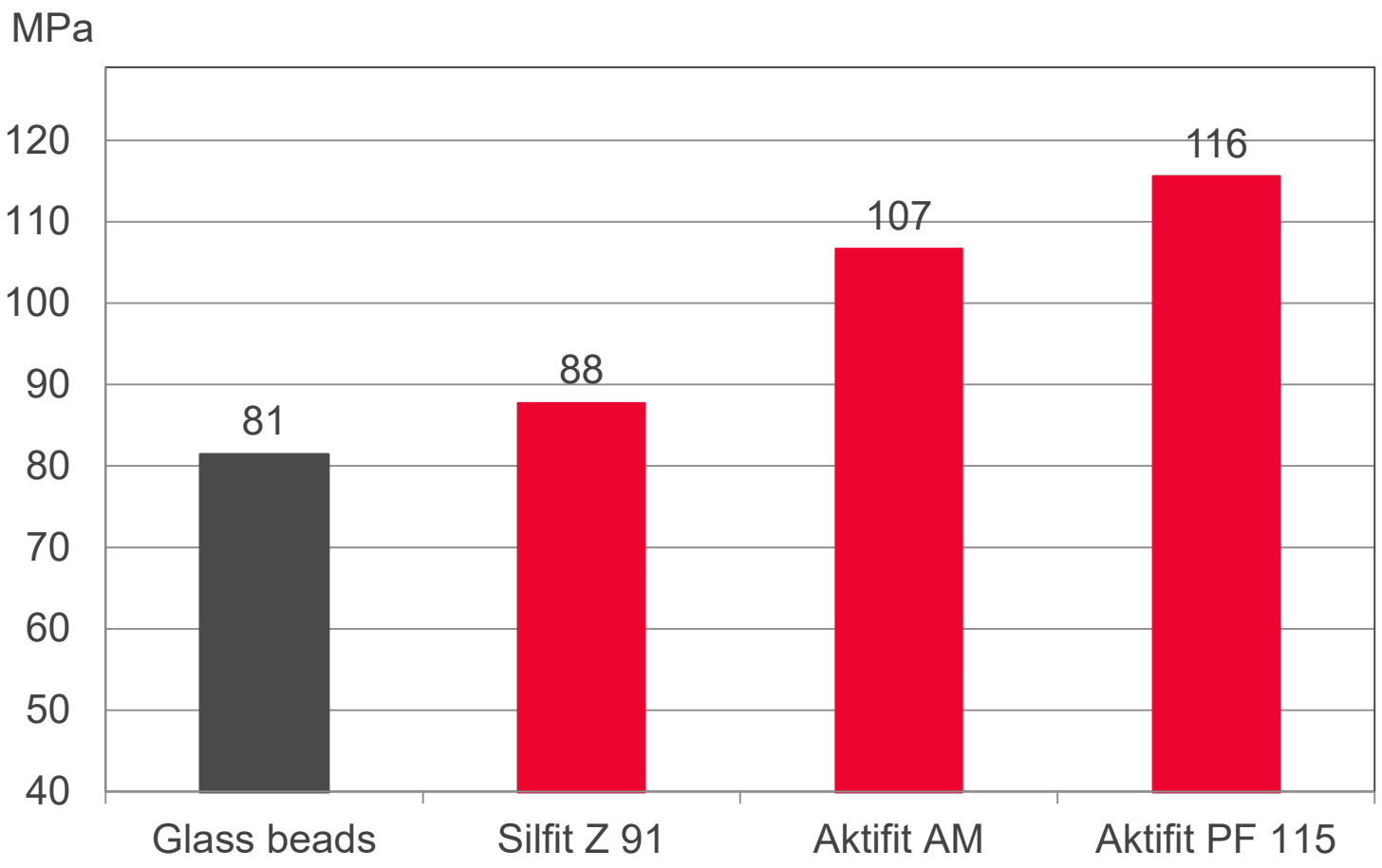




# Flexural Strength

DIN EN ISO 178

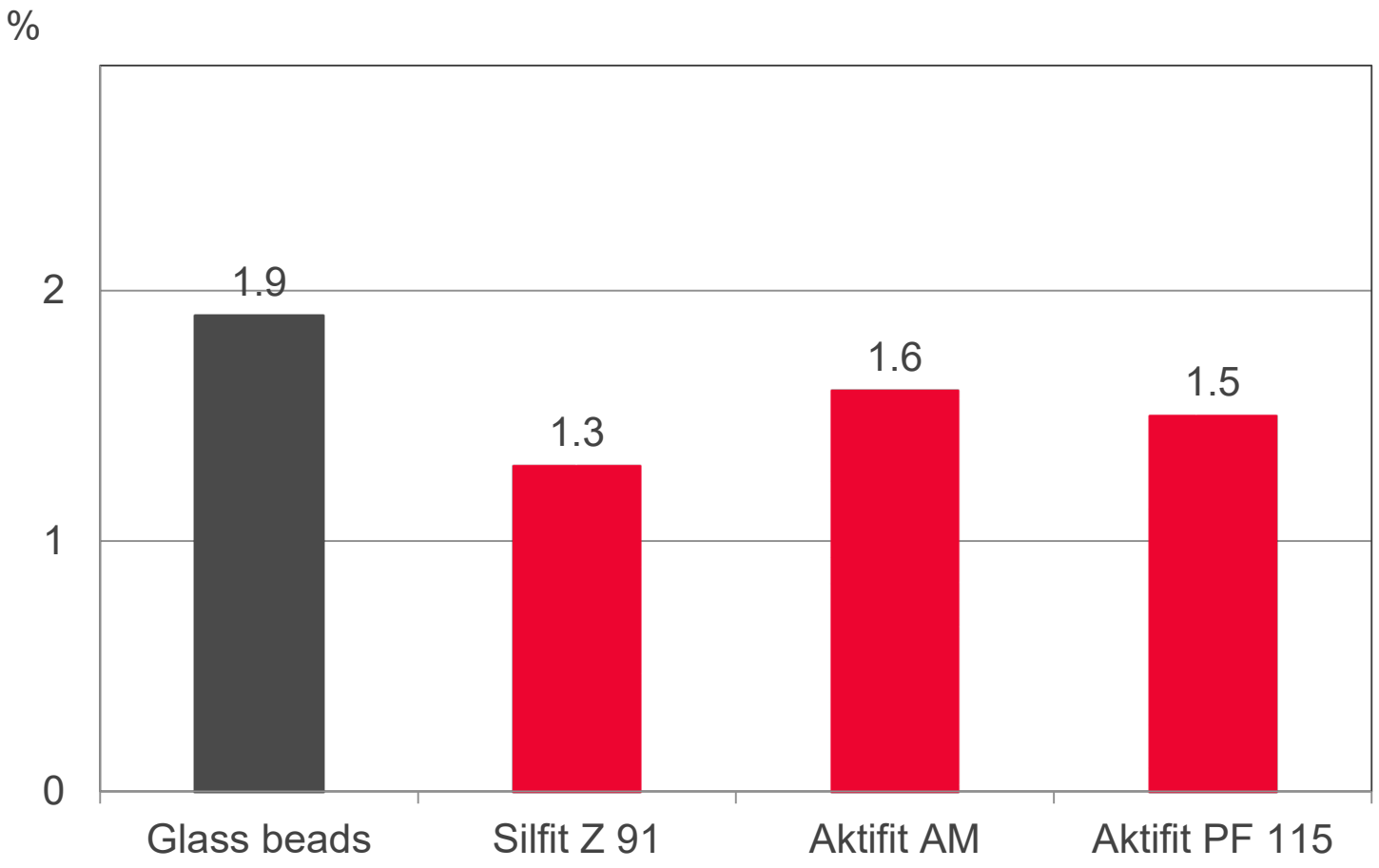




# Flexural Strain at Break

DIN EN ISO 178

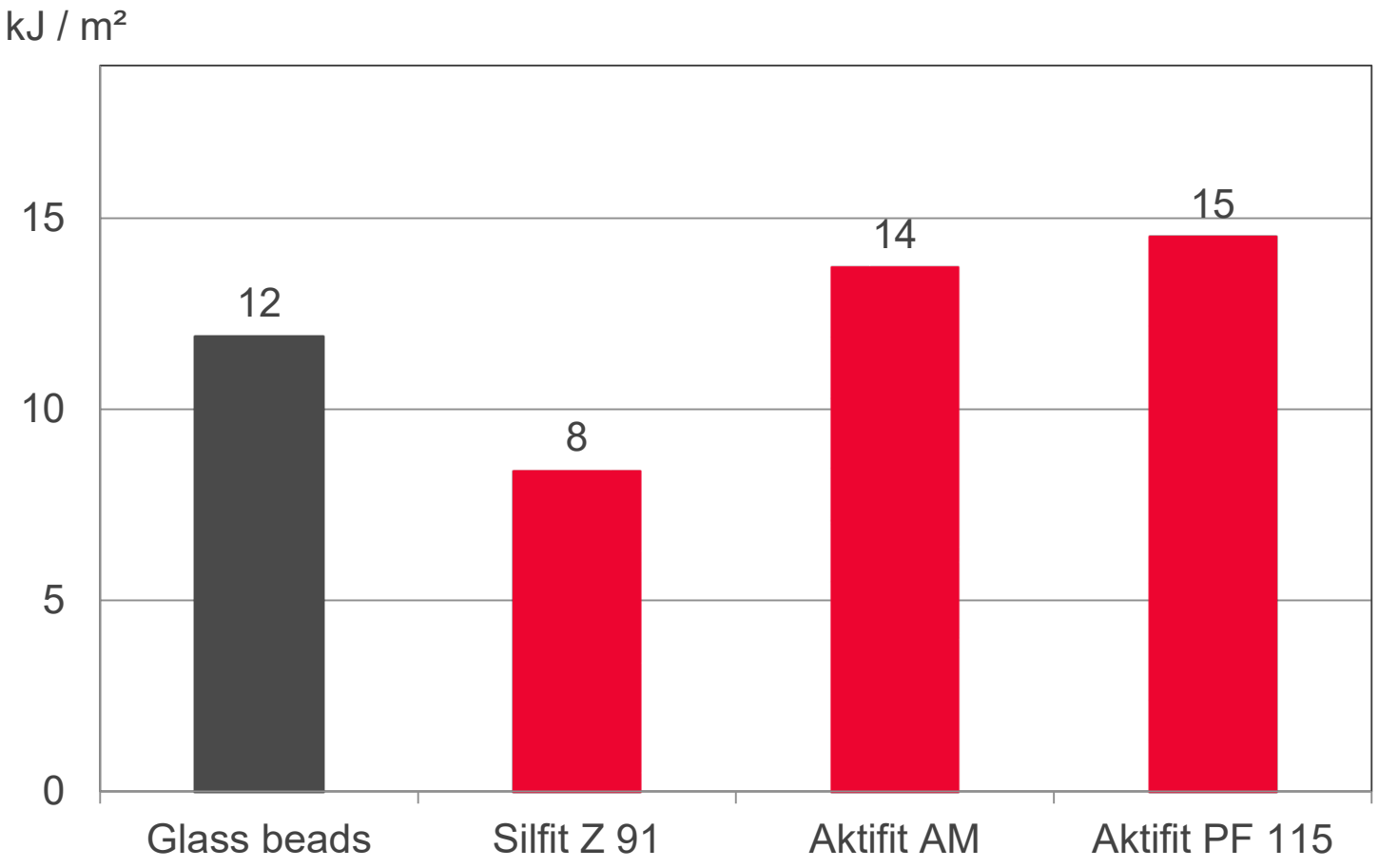




# Charpy
# Impact Strength

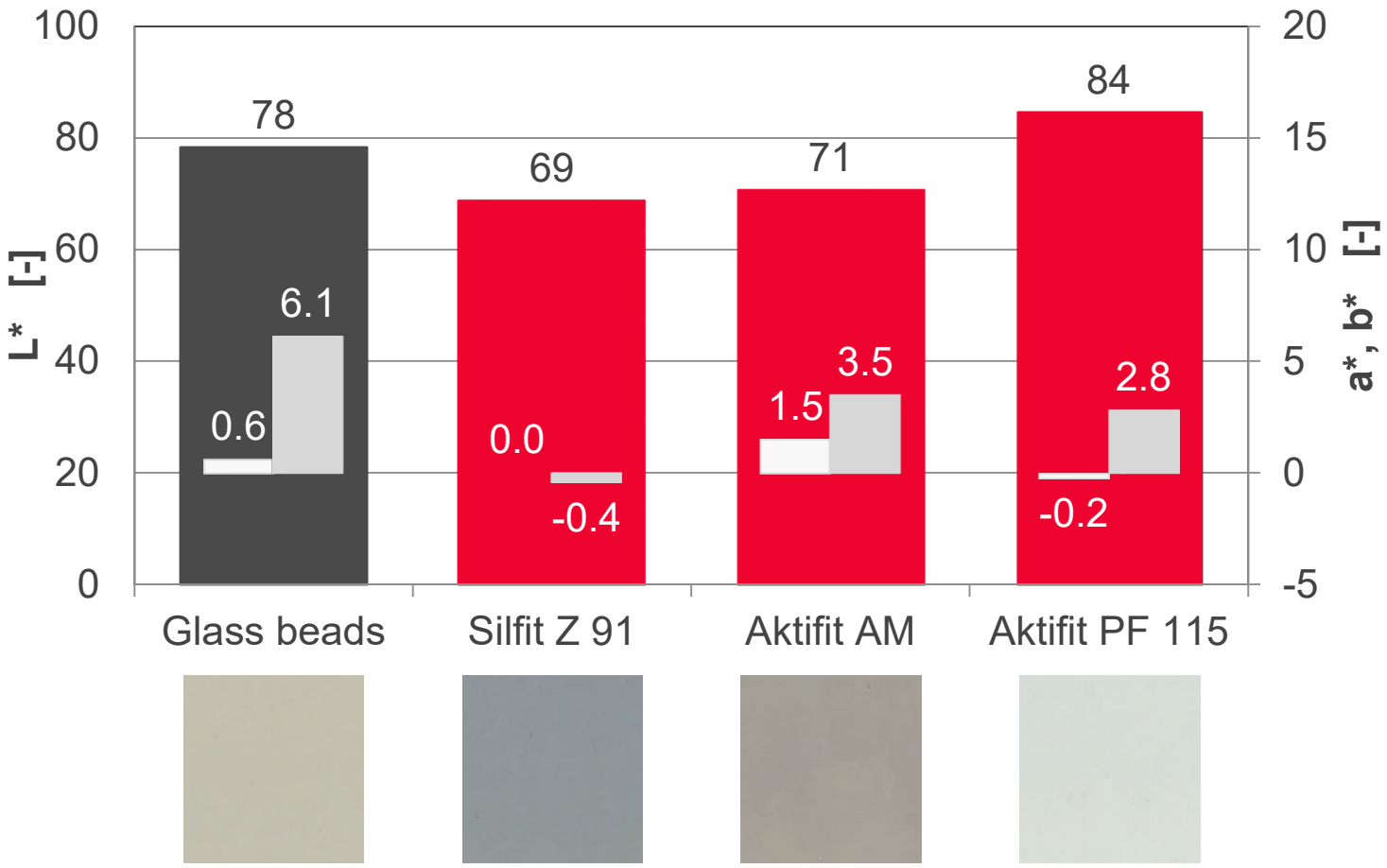
DIN EN ISO 179-1/1eU, 23 °C





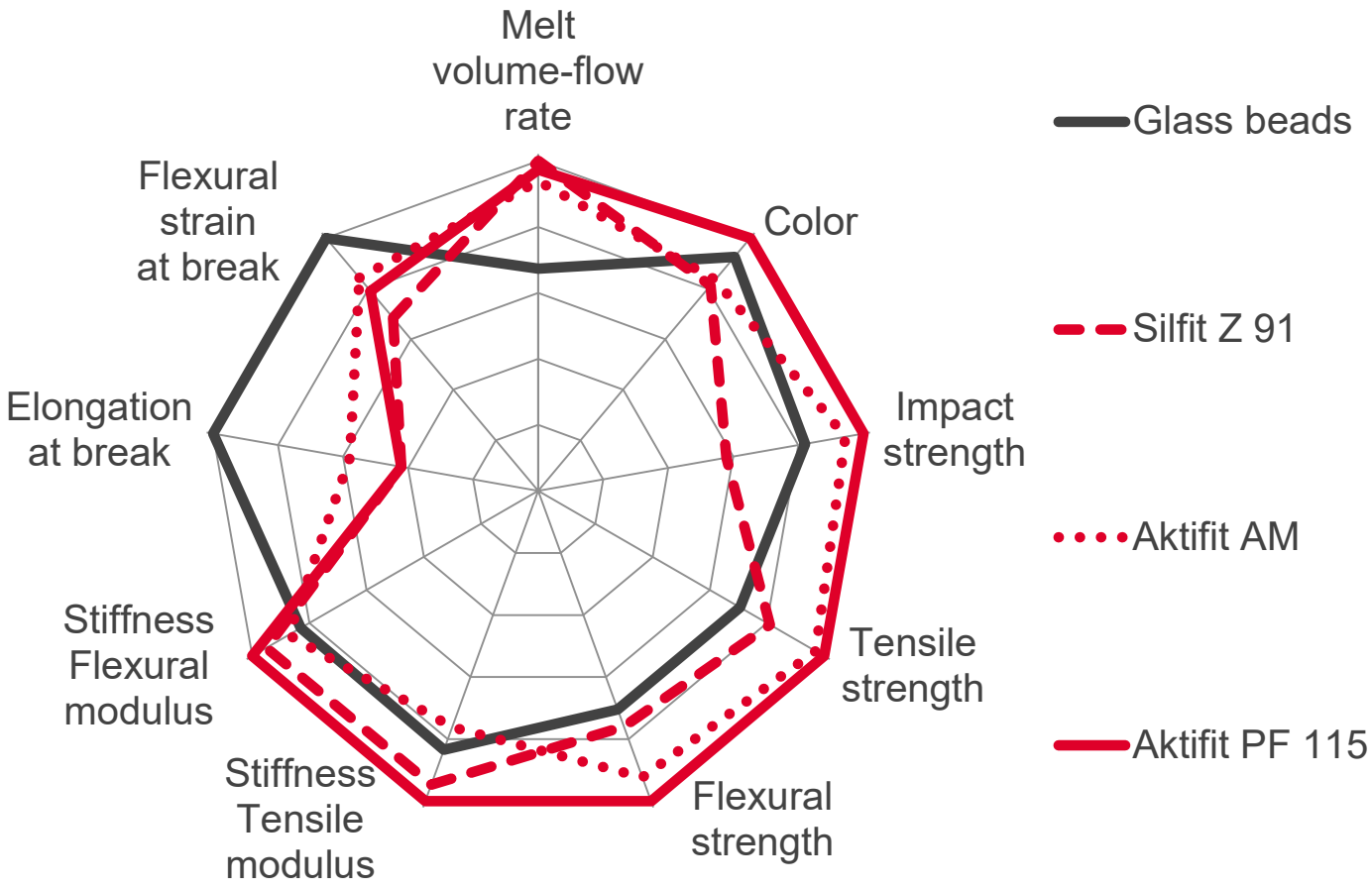
# Color of Compounds





# Performance PPS





# Summary



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 of the compound

Aktifit PF 115 offers additionally:

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

# We supply material for good ideas!

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# Table of Results



| | | Glass beads | Silfit Z 91 | Aktifit AM | Aktifit PF 115 |
|---|---|---|---|---|---|
| Melt Volume-flow Rate | cm³/10 min | 54 | 80 | 75 | 78 |
| Tensile Modulus | GPa | 7.1 | 8.0 | 6.5 | 8.5 |
| Tensile Strength | MPa | 43 | 50 | 59 | 61 |
| Tensile Strain at Break | % | 1.9 | 0.8 | 1.1 | 0.8 |
| Flexural Modulus | GPa | 6.9 | 7.9 | 7.3 | 8.3 |
| Flexural Strength | MPa | 81 | 88 | 107 | 116 |
| Flexural Strain at Break | % | 1.9 | 1.3 | 1.3 | 1.5 |
| Impact Strength 23 °C Charpy, 1eU | kJ/m² | 12 C | 8 C | 14 C | 15 C |
| Notched Imp. Strength 23 °C Charpy, 1eA | kJ/m² | 1.4 C | 1.0 C | 1.0 C | 1.0 C |
| Color Value CIELab L* | - | 78.1 | 68.6 | 70.5 | 84.4 |
| a* | - | 0.6 | 0.0 | 1.5 | -0.2 |
| b* | - | 6.1 | -0.4 | 3.5 | 2.8 |