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UNIVERSITÀ
DEGLI STUDI
DI BRESCIA

Stefano Gozzini

USO DI PROPRIETÀ TRASFERIBILI DA PROVINO A MANUFATTO NELL'INNOVAZIONE DI PRODOTTO: UN CASO DI STUDIO

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1

UNIVET



UNIVET

Univet's mission is to protect people creating glasses with unique design, optimal fitting and maximum performance.



International
design awards



1997

Head- quarters

Rezzato (BS)



Industrial protection – Safety

Everyday people suffer workplace injuries to eyes and face.
The risk of facial injuries can be reduced by using safety glasses.



Laser eye protection

Univet has been developing and testing many high-quality patented technologies, materials, new filters and coatings. Nowadays, Univet can provide a personal protection equipment (PPE) and devices for lots of laser applications.





Loupes

Healthcare professionals such as surgeons and dentists can extend better care for their patients with the help of magnification systems offering improved visual acuity.

Augmented reality VisionAR - Smart glasses

The first & only augmented reality safety glasses that combines the best of optical and electronic technologies.
Applied in: remote assistance, manufacturing process, logistics .







2


PhD Programme in
Mechanical and Industrial Engineering,
XXXVIII cycle, A.Y. 2022/2023

Topic research

"Research and development of innovative eco-sustainable solutions related to materials and processes aimed at the creation of products and packaging in the field of PPE for face protection"

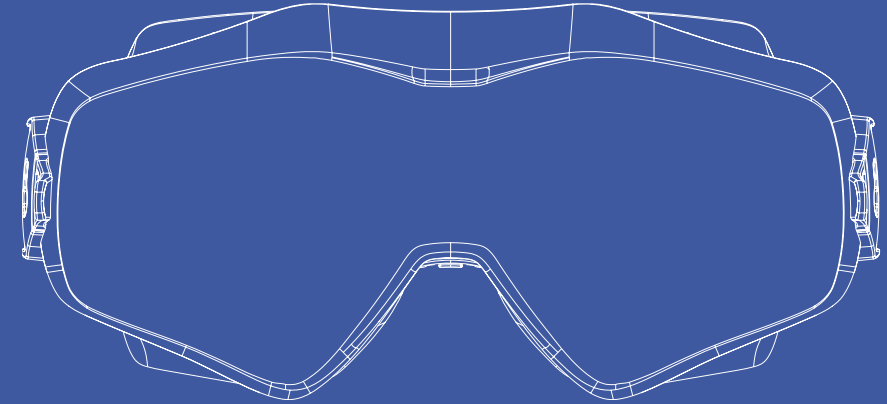
My PhD research project

Re-design driven by Sustainability



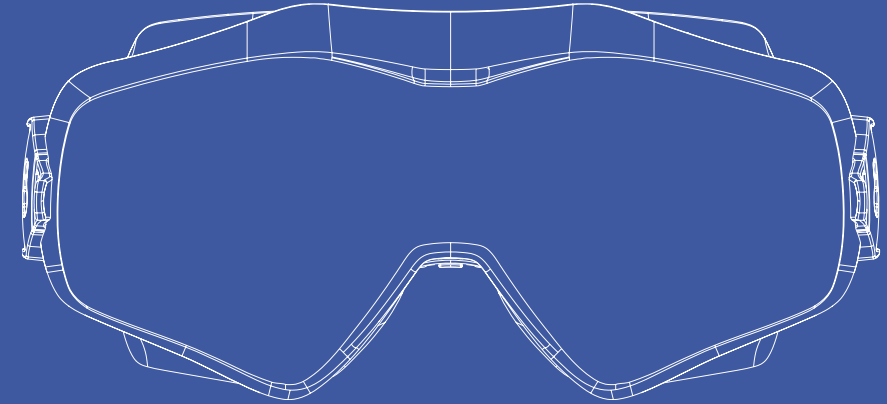
Re-design driven by Sustainability

Focus on
A successful product
commercialized by
Univet



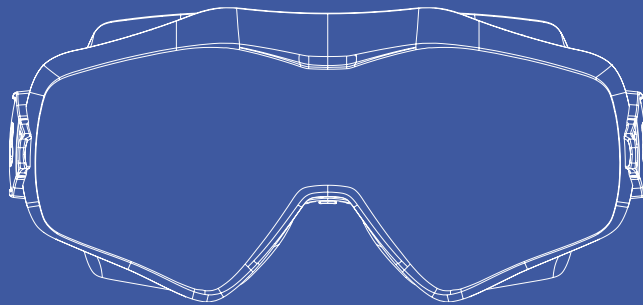
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Fossil-based

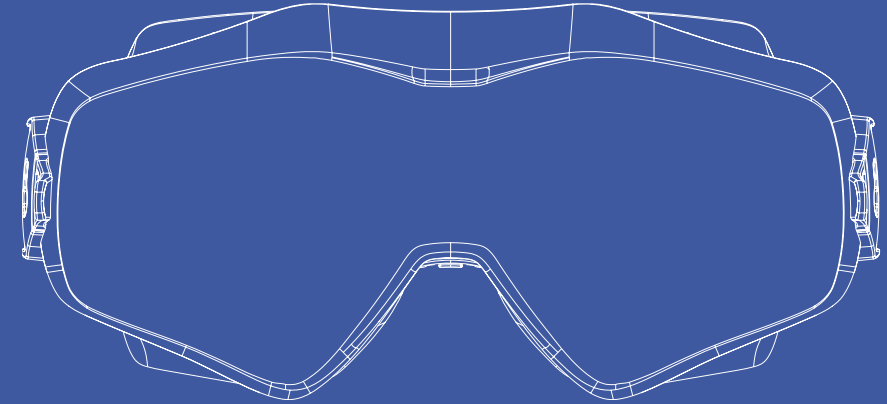
Starting point



non-renewable sources polymers

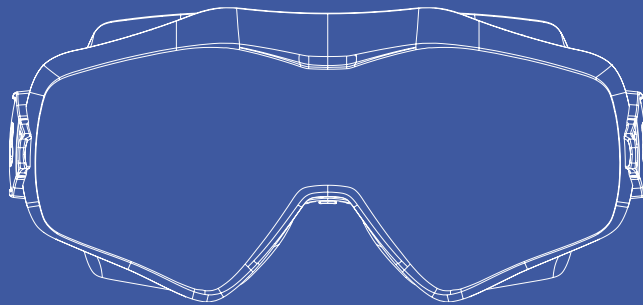
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Fossil-based

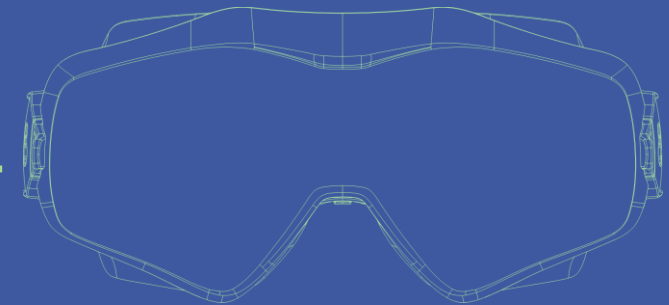
Starting point



non-renewable sources polymers

Bio-based

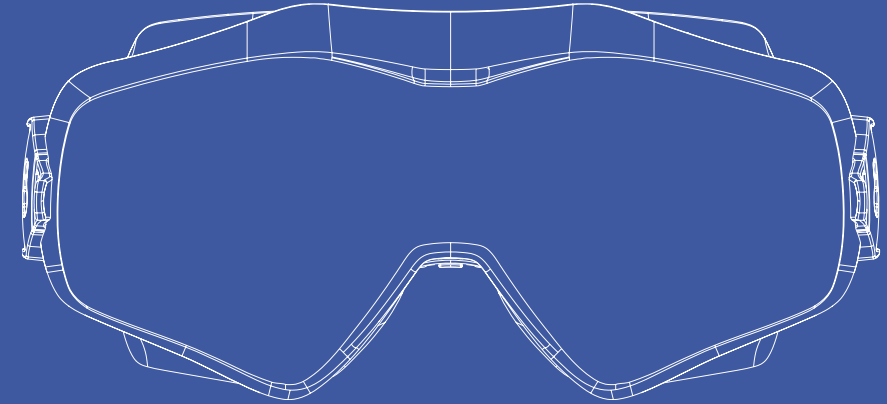
End point



renewable sources polymers

Re-design driven by Sustainability

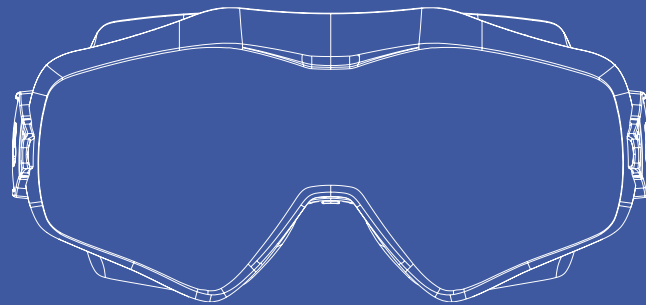
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Fossil-based

Bio-based

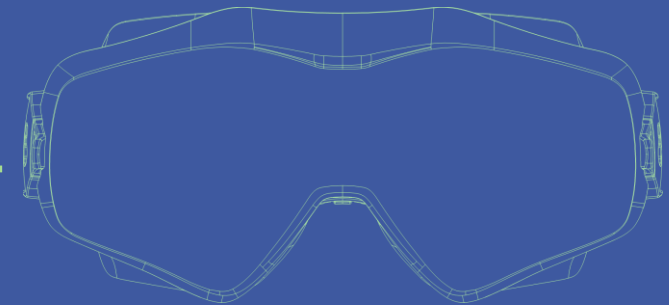
Starting point



“Fossil-based polymer replacement”



End point



non-renewable sources polymers

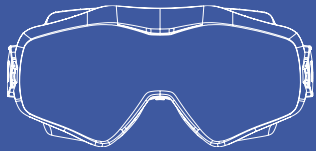
renewable sources polymers

Design constraints

Re-design driven
by
Sustainability

Fossil-based

Starting point

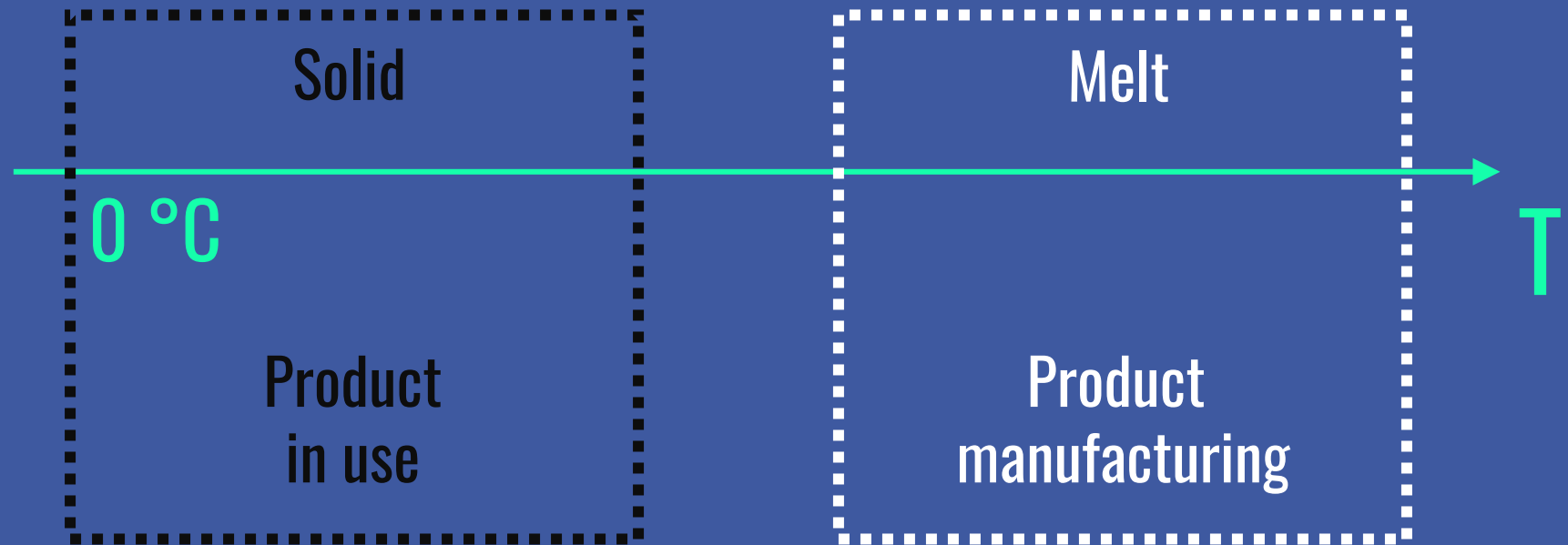
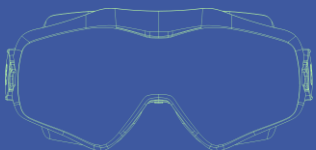


"Fossil-based polymer replacement"



Bio-based

End point

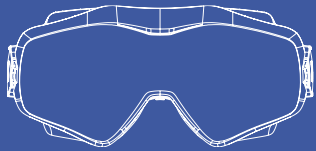


Design constraints

Re-design driven
by
Sustainability

Fossil-based

Starting point

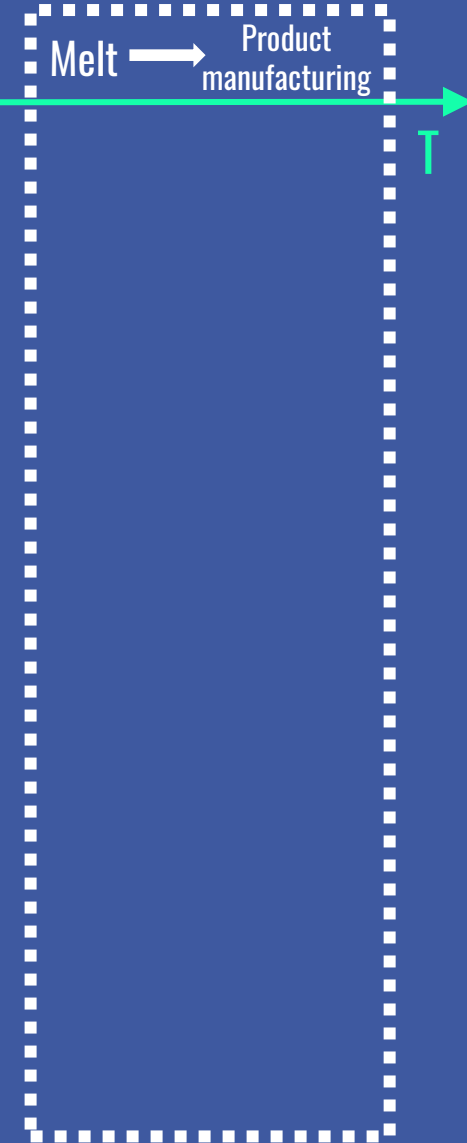
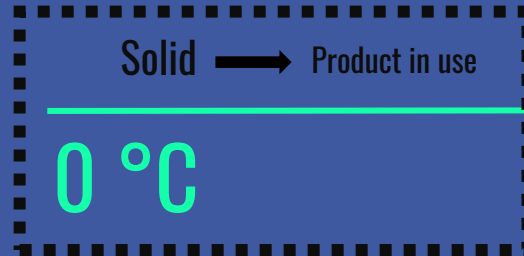
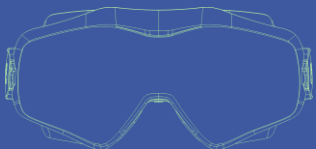


"Fossil-based polymer replacement"



Bio-based

End point

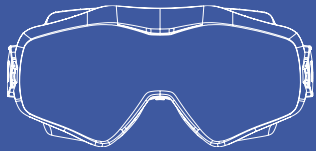


Design constraints

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Fossil-based

Starting point

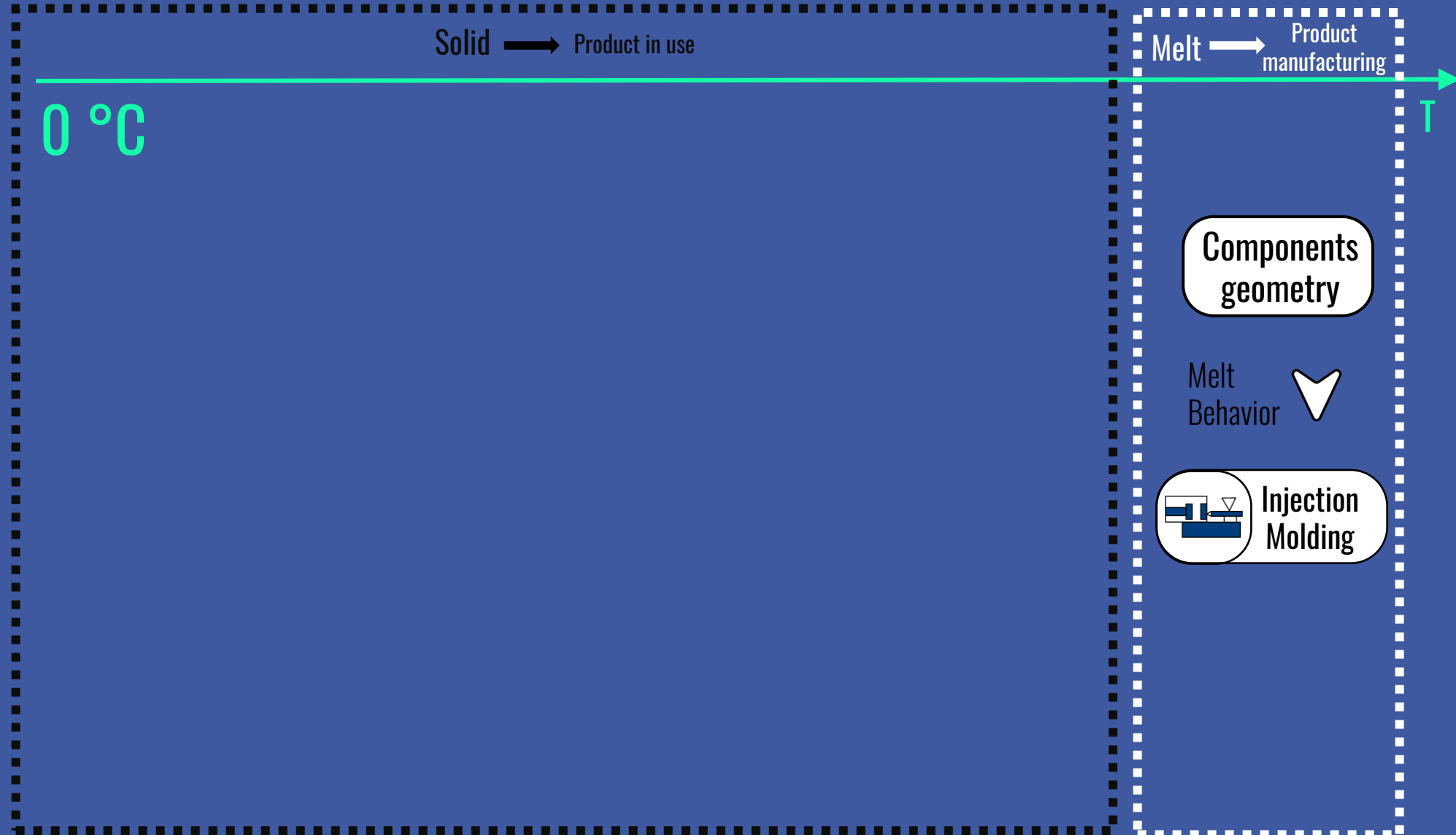
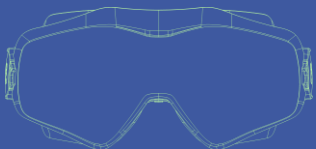


"Fossil-based polymer replacement"



Bio-based

End point

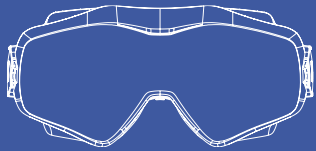


Design constraints

Re-design driven
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Sustainability

Fossil-based

Starting point

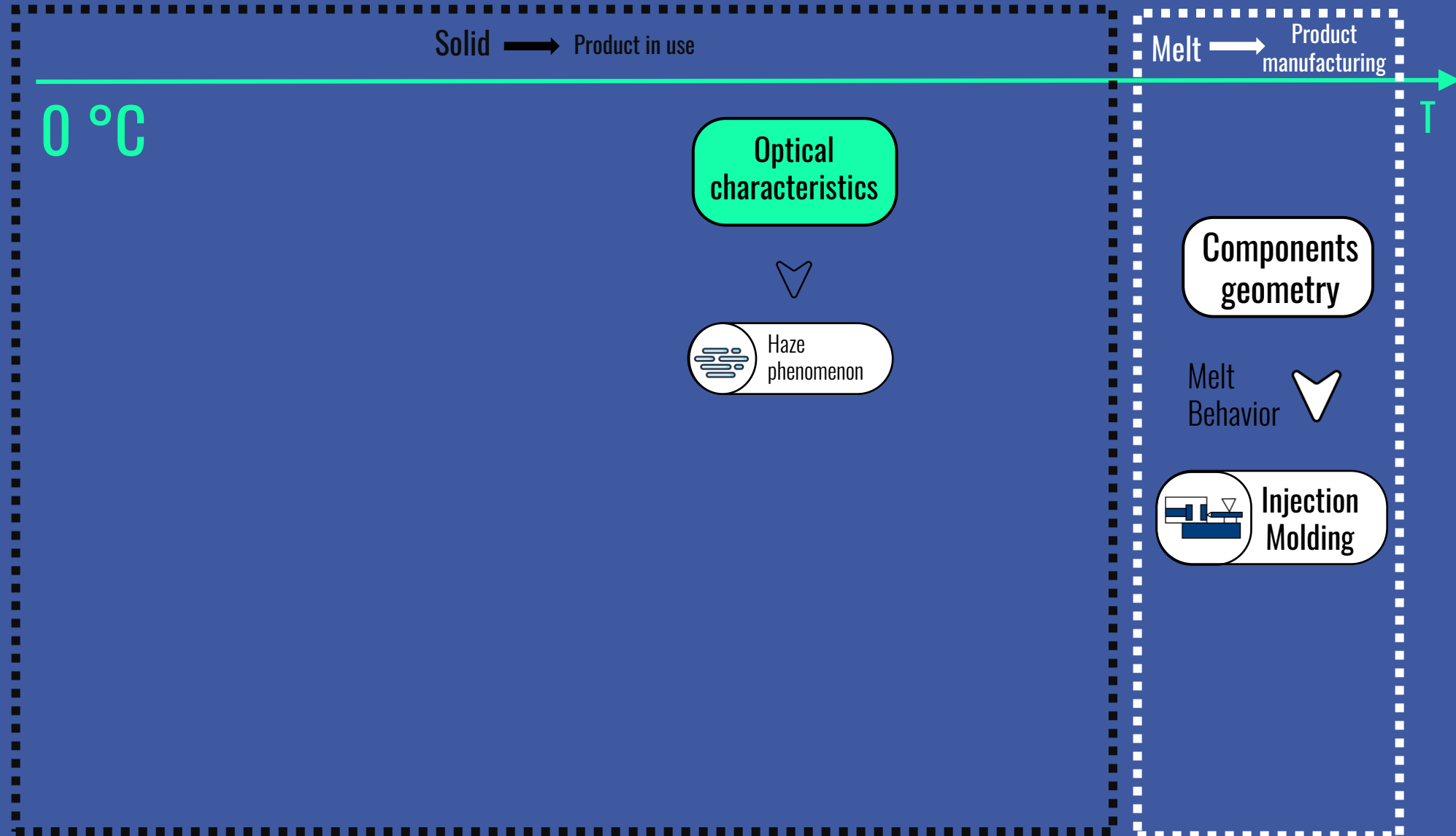
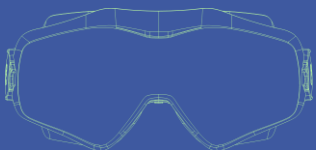


“Fossil-based polymer replacement”



Bio-based

End point

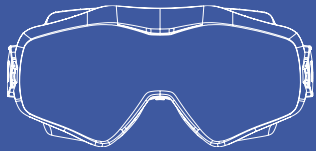


Design constraints

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Fossil-based

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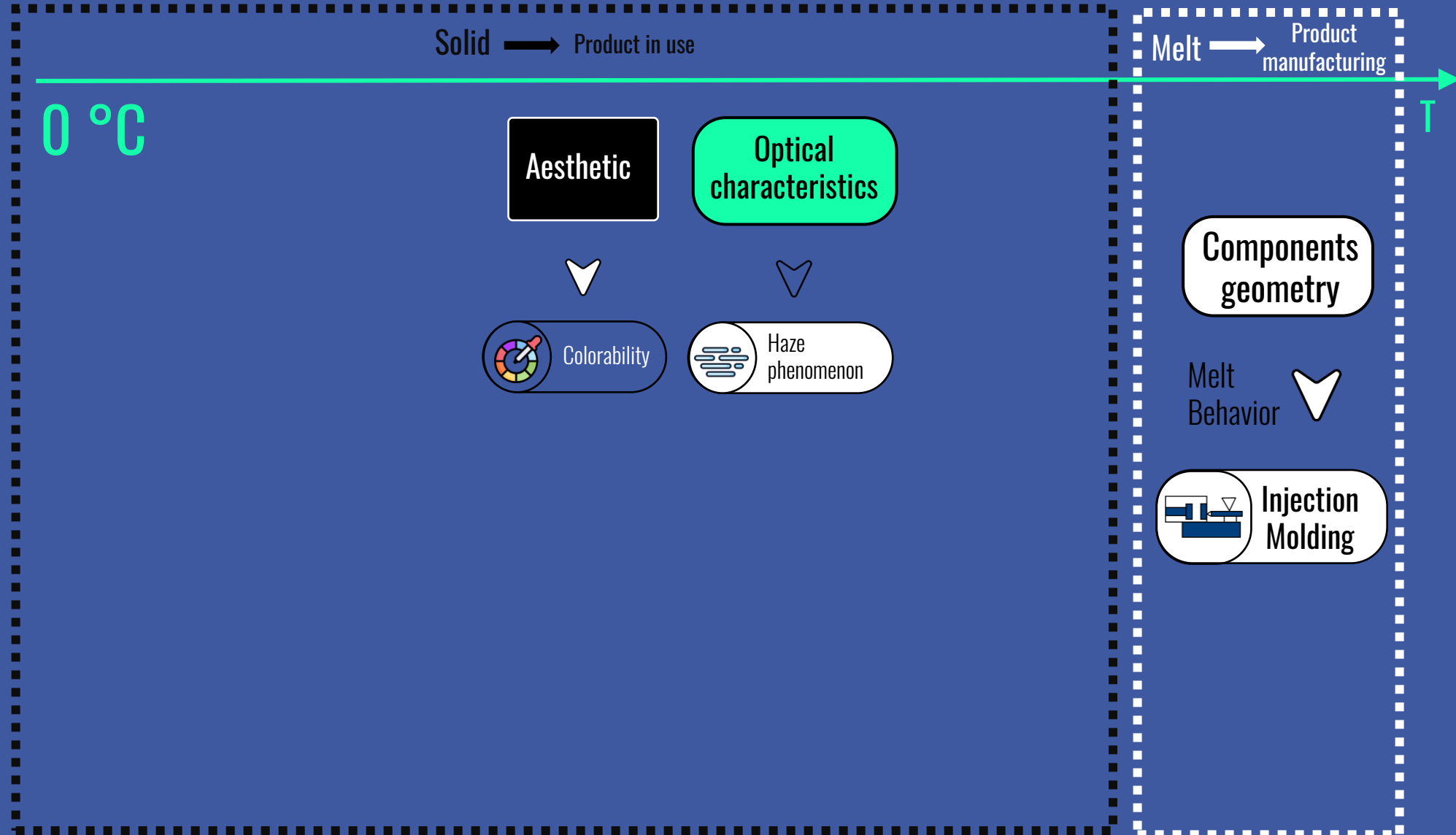
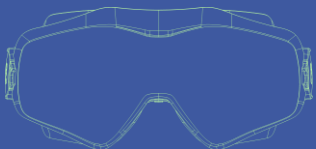


"Fossil-based polymer replacement"



Bio-based

End point

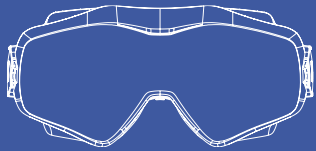


Design constraints

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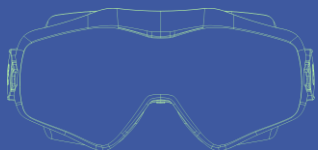
Fossil-based



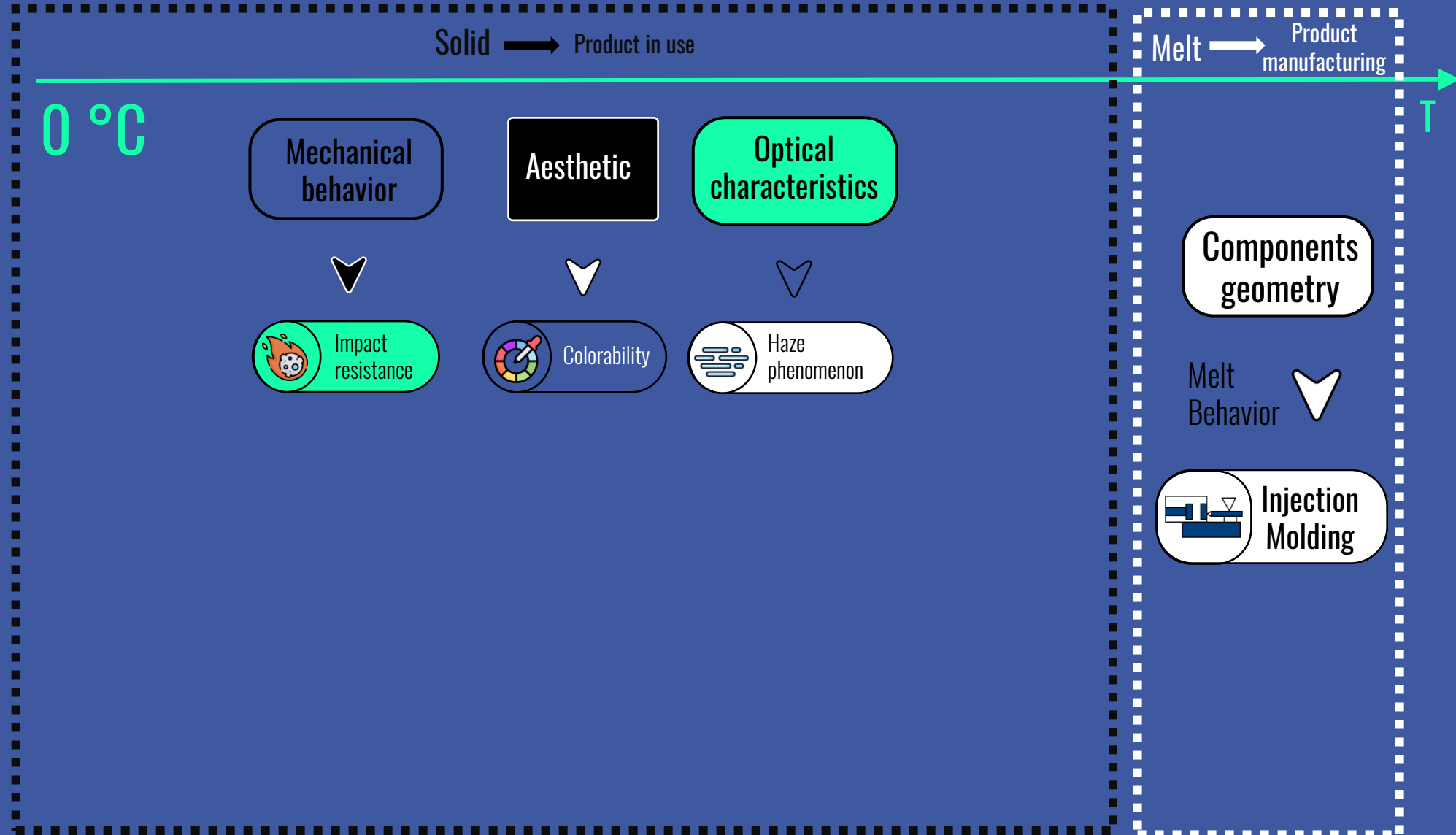
"Fossil-based polymer replacement"



Bio-based



End point

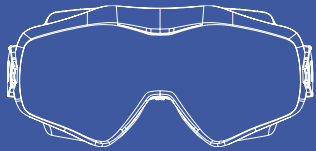


Design constraints

Re-design driven
by
Sustainability

Fossil-based

Starting point

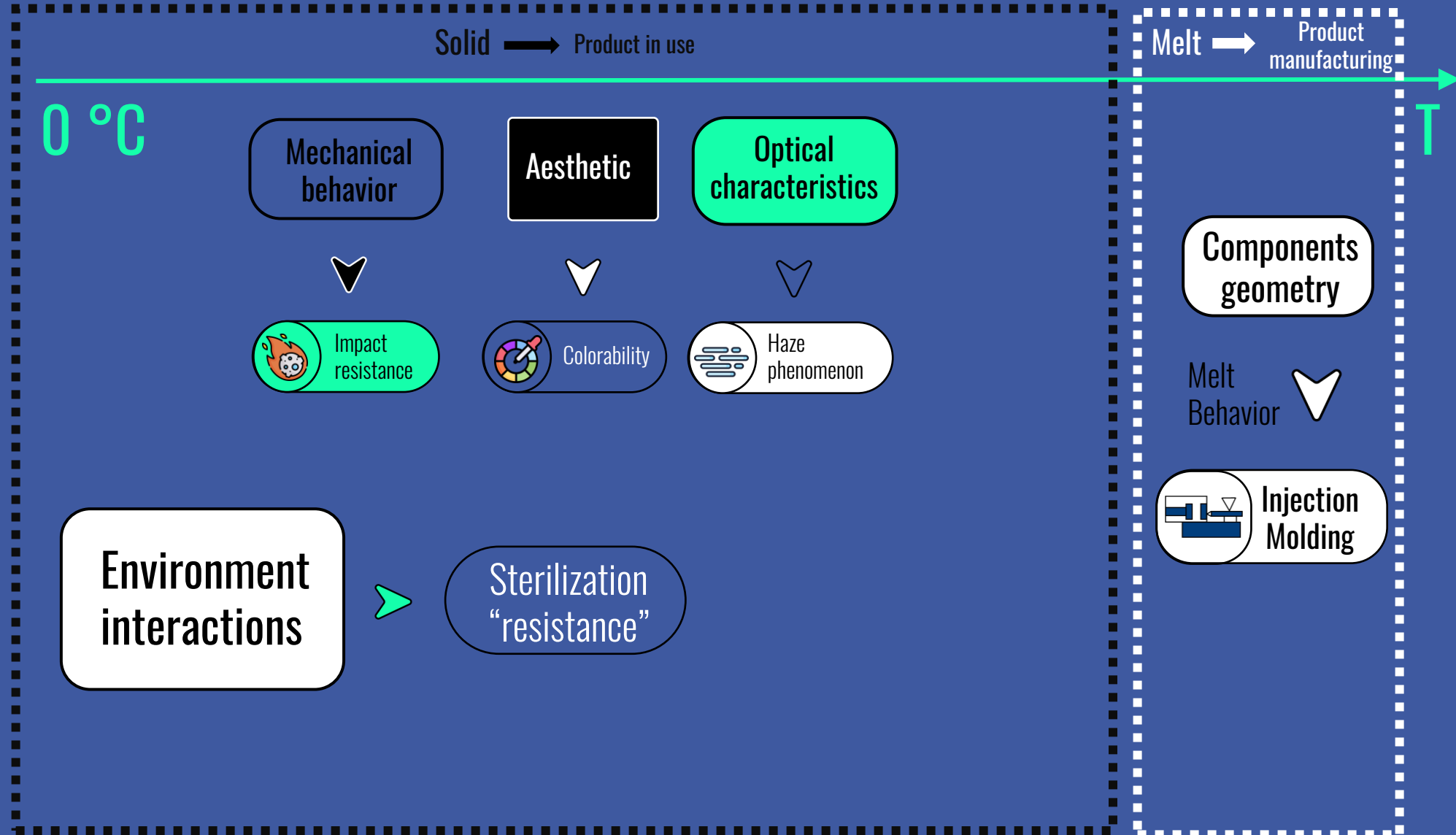
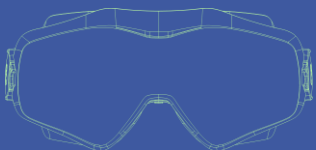


“Fossil-based polymer replacement”



Bio-based

End point

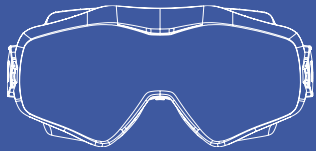


Design constraints

Re-design driven
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Sustainability

Fossil-based

Starting point

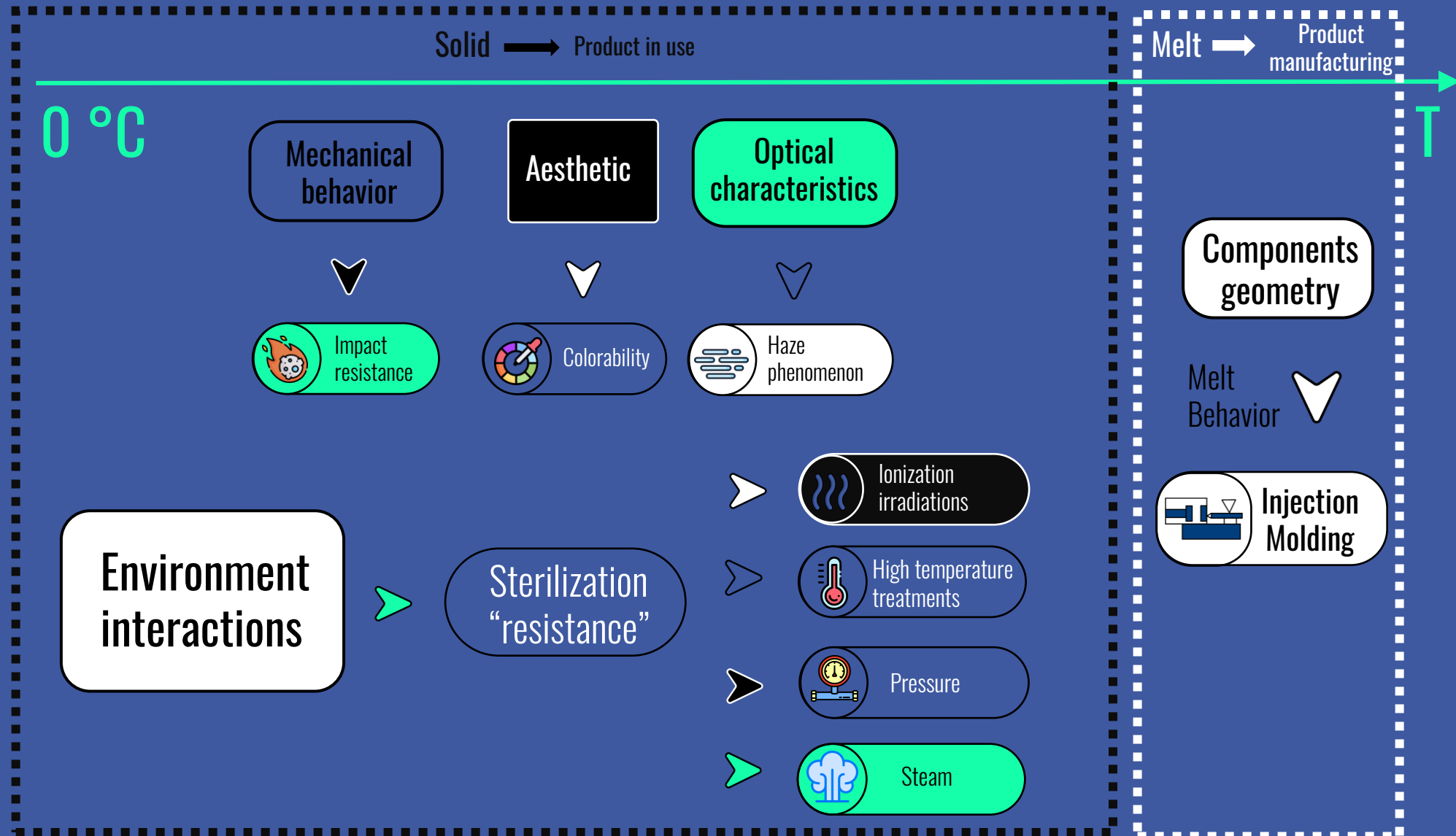
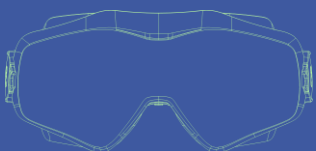


“Fossil-based polymer replacement”



Bio-based

End point

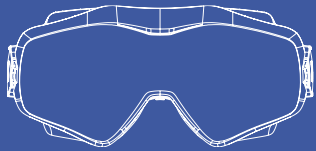


Design constraints

Re-design driven
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Sustainability

Fossil-based

Starting point

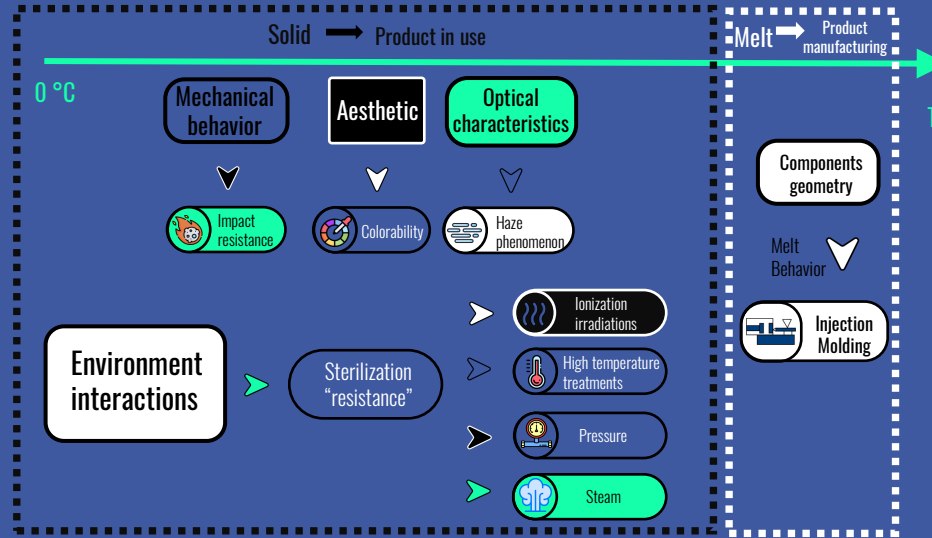
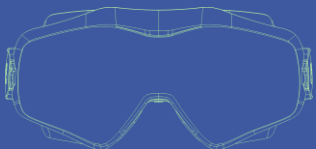


"Fossil-based polymer replacement"



Bio-based

End point



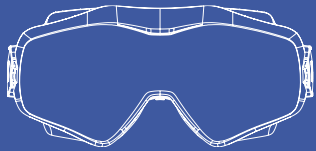
Design constraints

Univet

Re-design driven
by
Sustainability

Fossil-based

Starting point

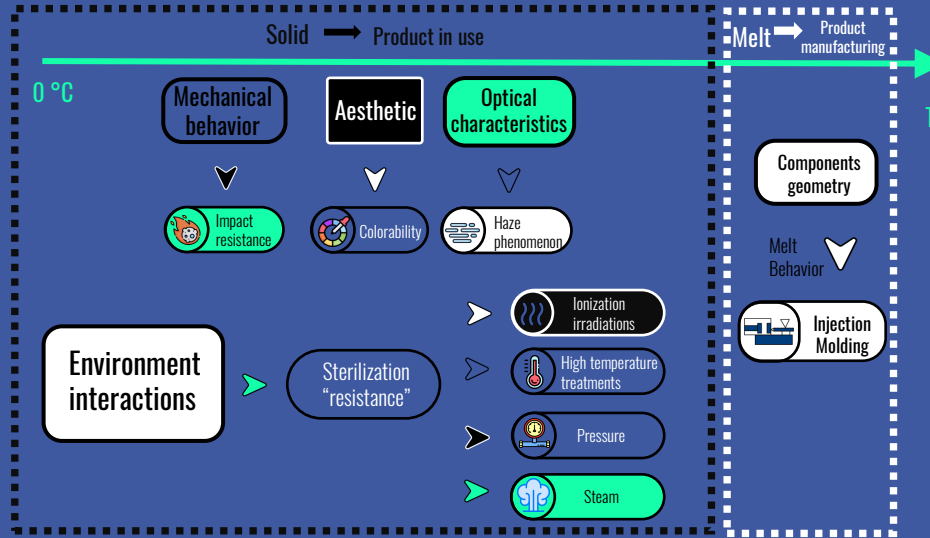
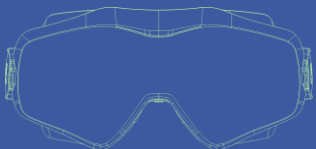


"Fossil-based polymer replacement"

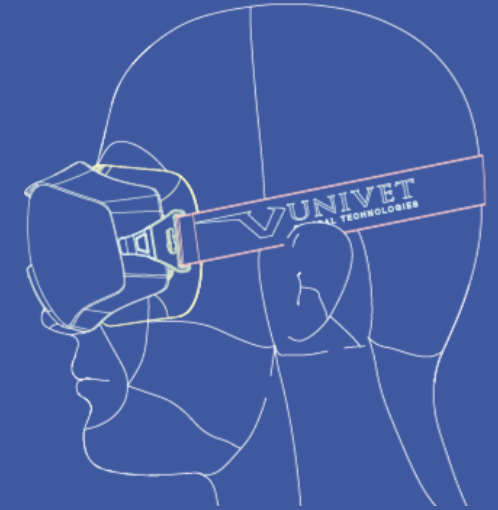


Bio-based

End point



Straight to the
final product



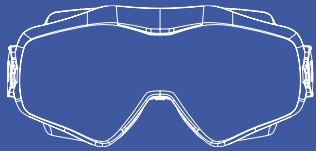
Design constraints

Univet

Re-design driven
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Fossil-based

Starting point

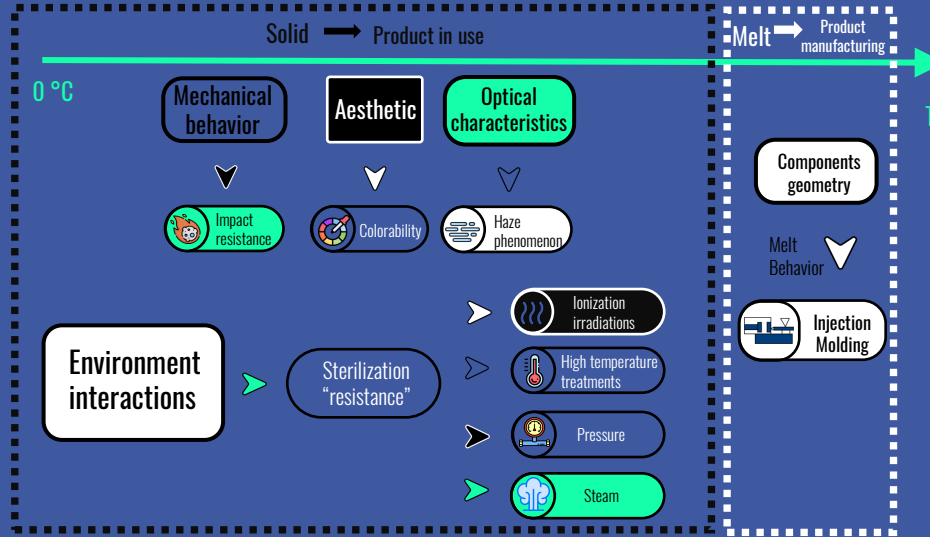
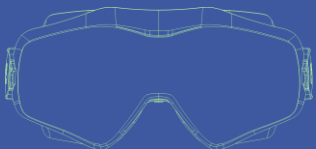


"Fossil-based polymer replacement"

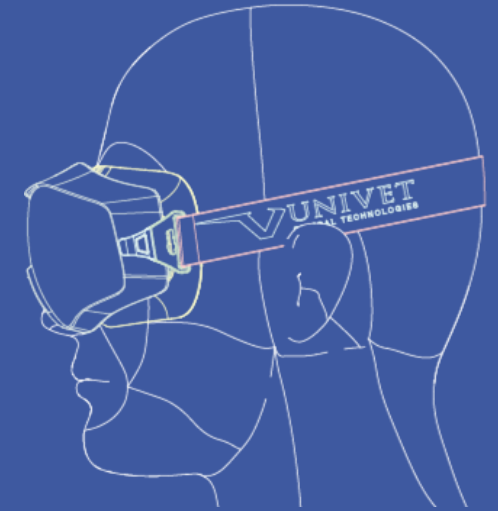


Bio-based

End point



Straight to the
final product



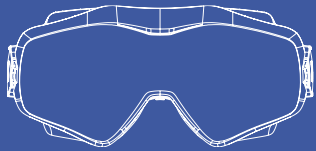
Supported by
testing on the
final product

Design constraints

Re-design driven
by
Sustainability

Fossil-based

Starting point

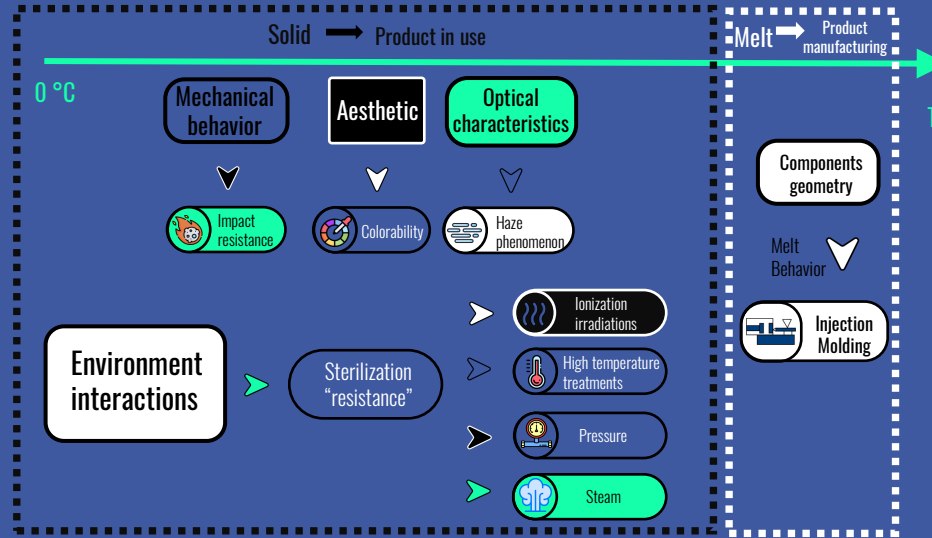
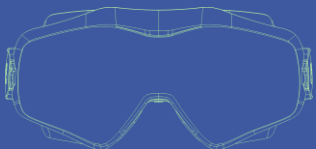


"Fossil-based polymer replacement"

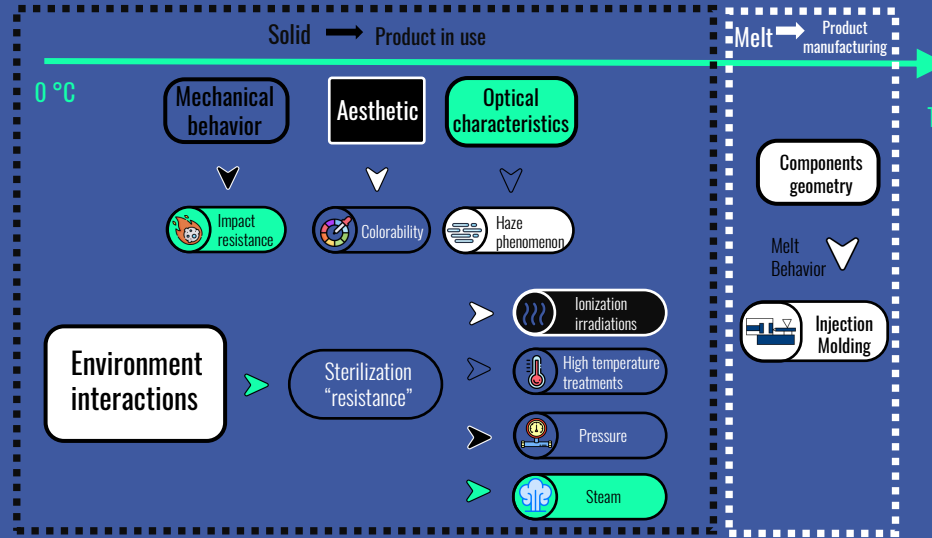


Bio-based

End point

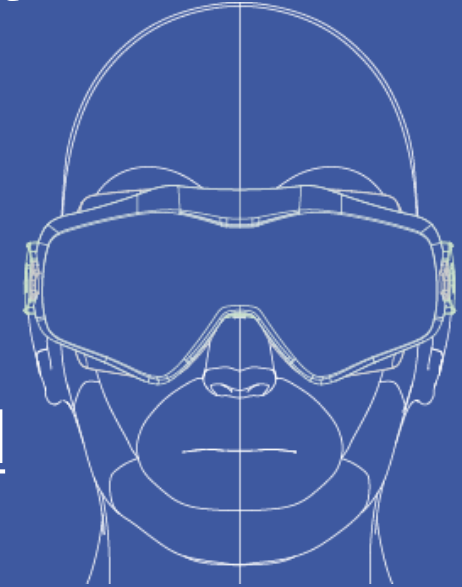


Design constraints



My PhD Project

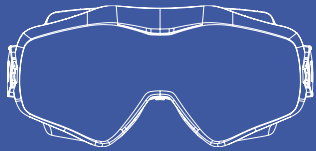
To the final product through the study of the intrinsic material behavior



Re-design driven
by
Sustainability

Fossil-based

Starting point

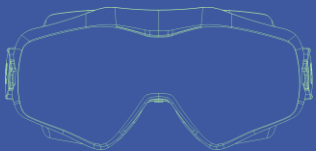


"Fossil-based polymer replacement"

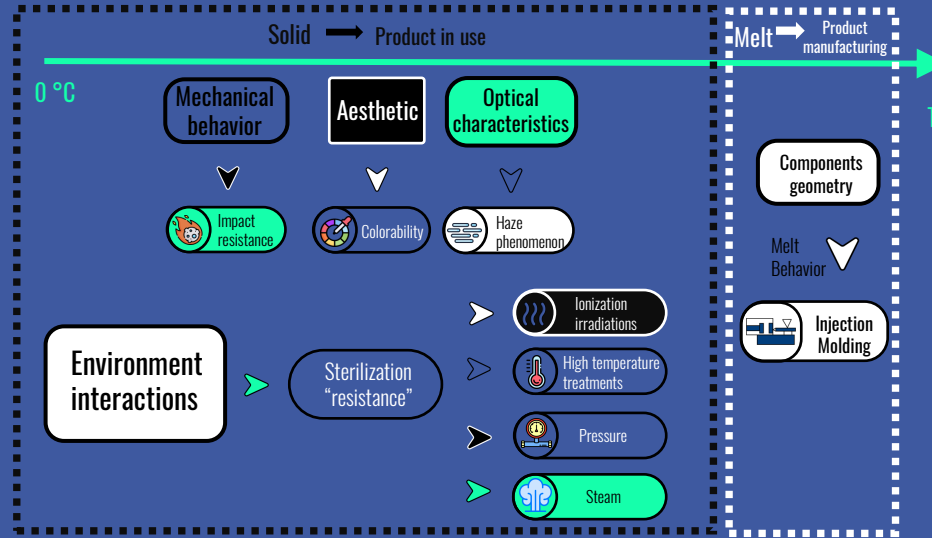


Bio-based

End point

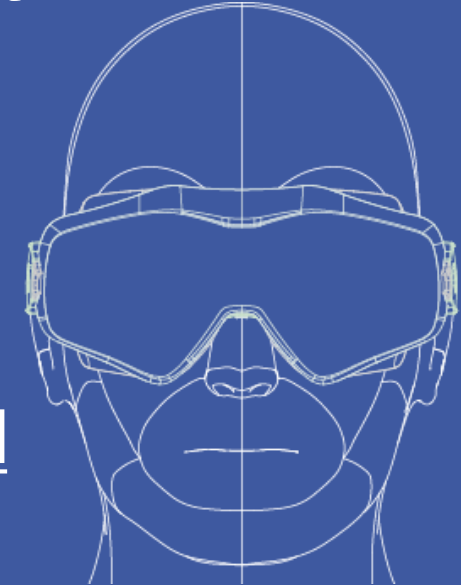


Design constraints



My PhD Project

To the final product through the study of the intrinsic material behavior

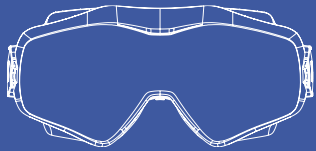


Supported by testing on appropriate materials in the form of specimens

Re-design driven by Sustainability

Fossil-based

Starting point

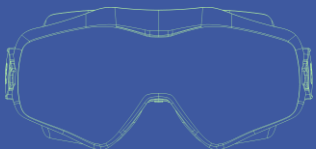


"Fossil-based polymer replacement"



Bio-based

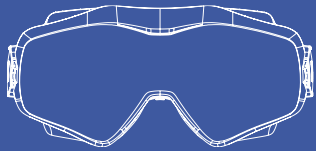
End point



Re-design driven
by
Sustainability

Fossil-based

Starting point

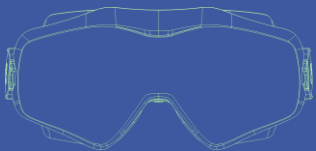


“Fossil-based polymer replacement”



Bio-based

End point

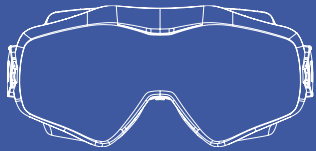


My PhD Project

Re-design driven
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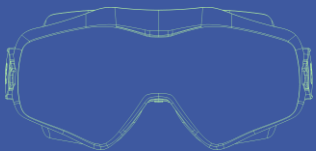


"Fossil-based polymer replacement"



Bio-based

End point



My PhD Project

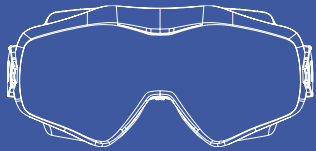


Workflow

Re-design driven
by
Sustainability

Starting point

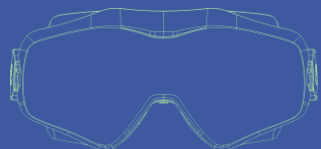
Fossil-based



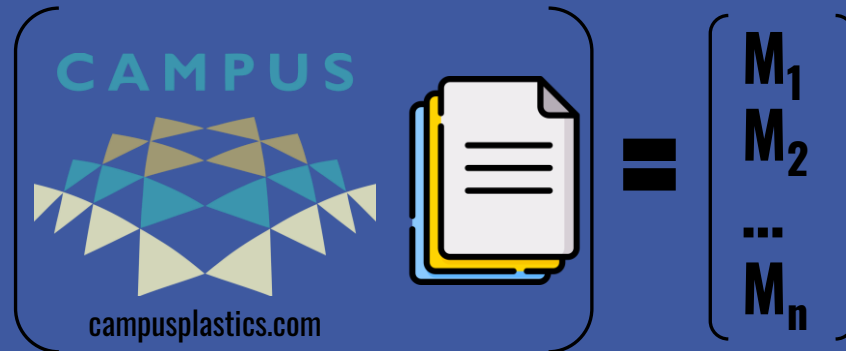
“Fossil-based polymer replacement”



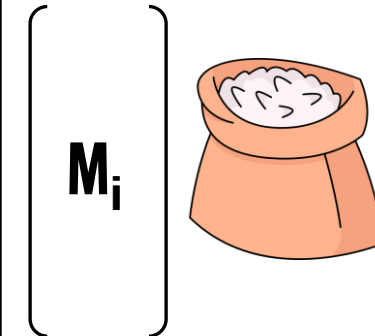
Bio-based



1 Bio-based polymer selection
from technical datasheets



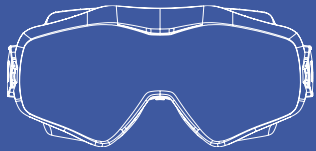
2 Materials
supply



Re-design driven
by
Sustainability

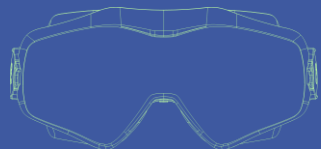
Starting point

Fossil-based



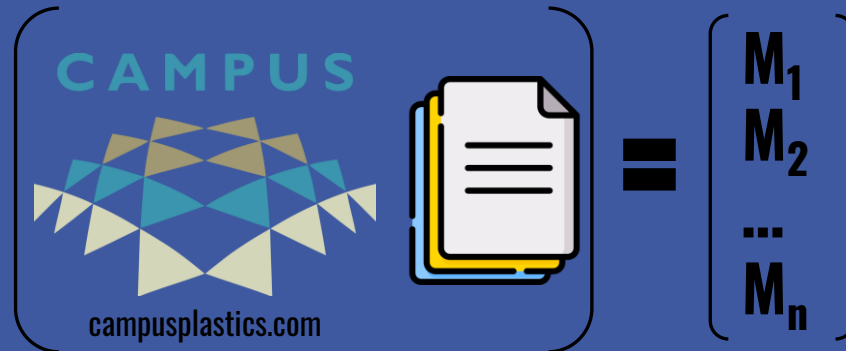
"Fossil-based polymer replacement"

Bio-based

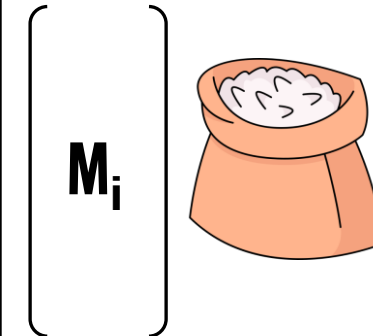


End point

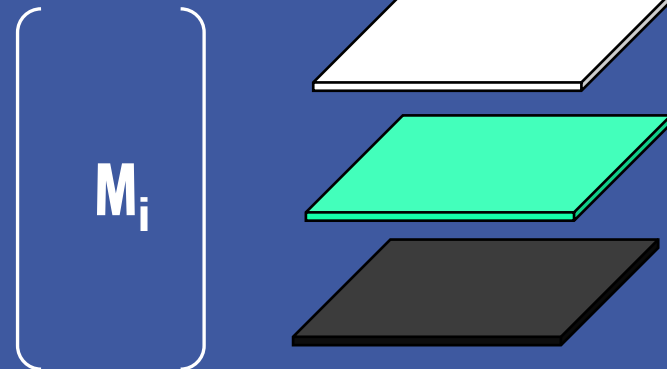
1 Bio-based polymer selection from technical datasheets



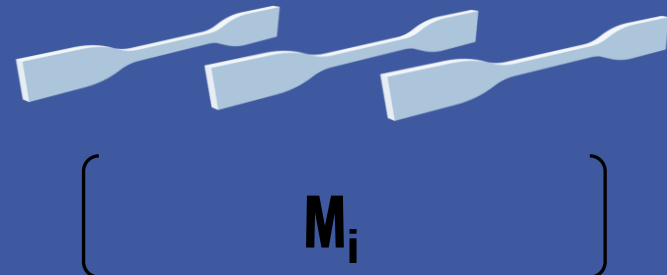
2 Materials supply



3 Plates injection molding



4 Specimen preparation

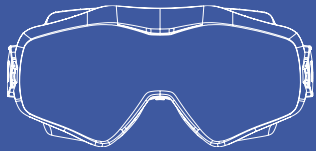


Workflow

Re-design driven
by
Sustainability

Fossil-based

Starting point

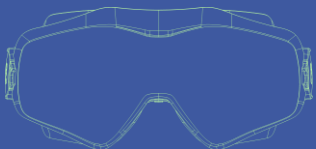


"Fossil-based polymer replacement"



Bio-based

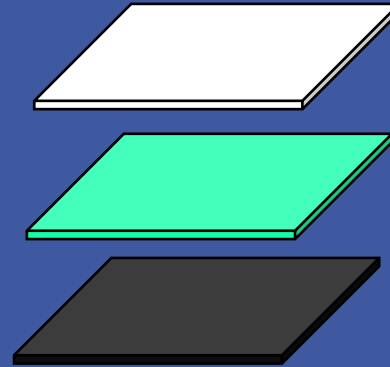
End point



3

Plates injection molding

M_i



4

Specimen preparation

M_i

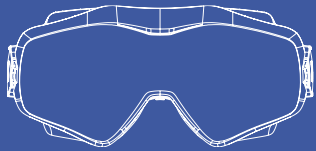


Workflow

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Starting point

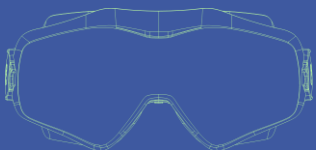


"Fossil-based polymer replacement"



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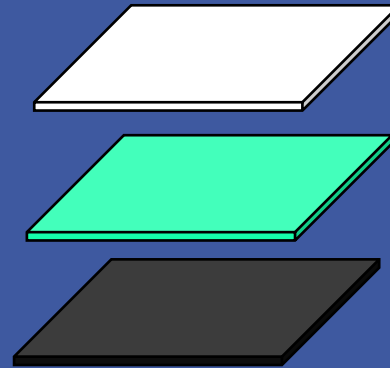
End point



3

Plates injection molding

M_i



4

Specimen preparation

M_i



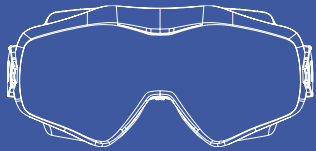
Fundamental step to reach the
appropriate specimen geometries
for the evaluation of the
intrinsic material properties

Workflow

Re-design driven
by
Sustainability

Fossil-based

Starting point

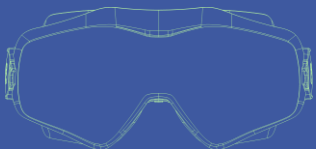


"Fossil-based polymer replacement"

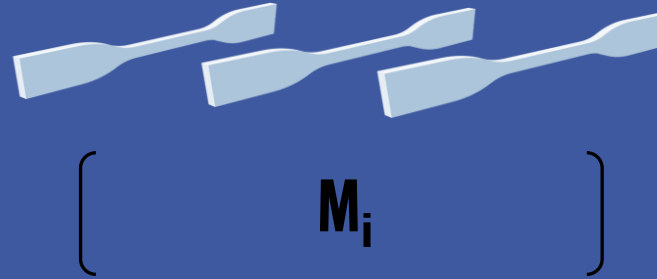


Bio-based

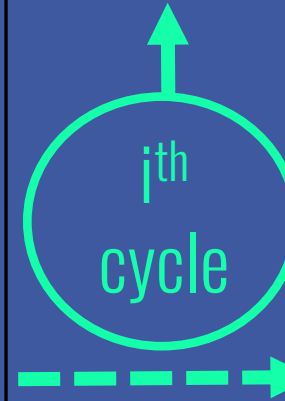
End point



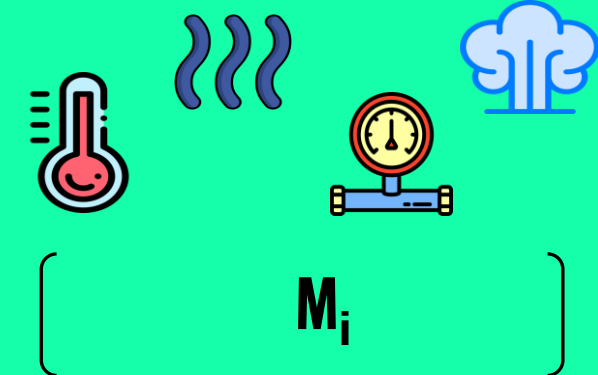
4 Specimen preparation



> 40



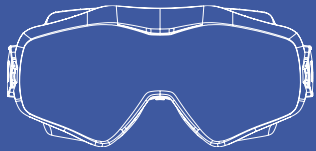
5 Ageing treatment



Re-design driven
by
Sustainability

Starting point

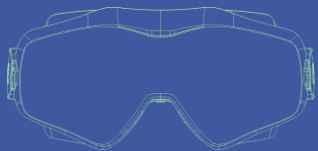
Fossil-based



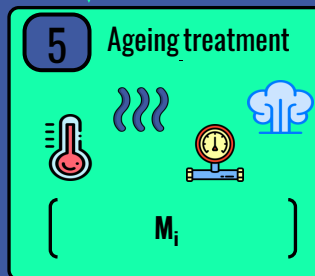
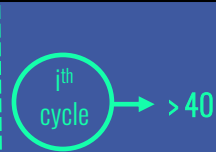
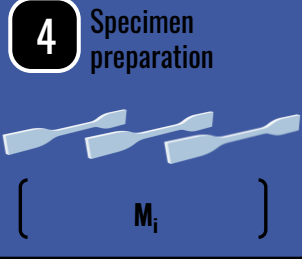
“Fossil-based polymer replacement”



Bio-based



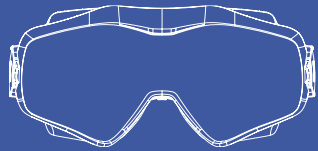
End point



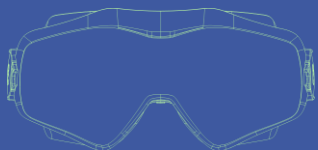
Workflow

Re-design driven
by
Sustainability

Fossil-based



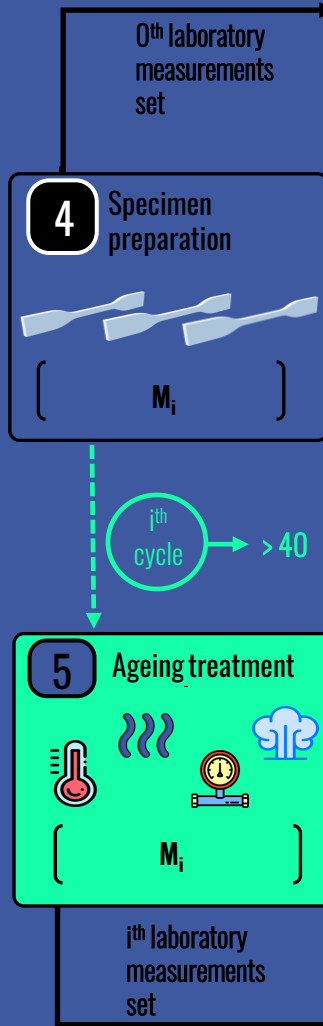
Bio-based



Starting point

End point

"Fossil-based polymer replacement"

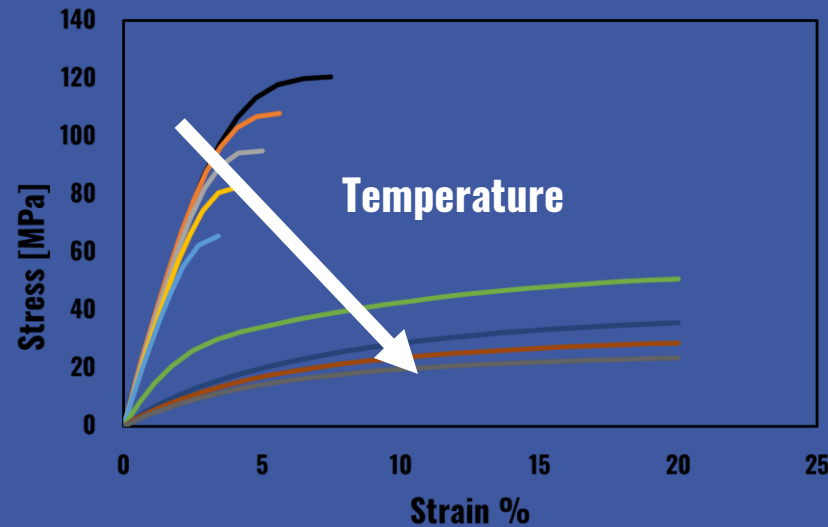


6

Laboratory measurements

Intrinsic Material Properties

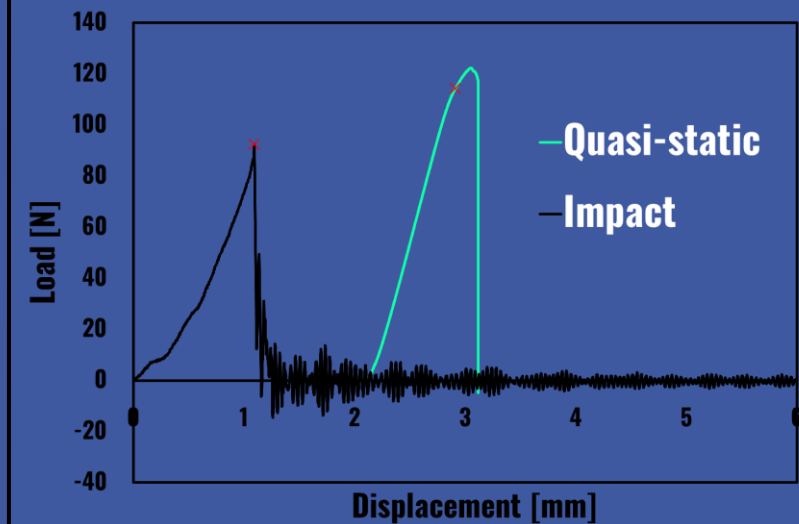
Tensile Test



Stiffness | E

$\sigma_y - \sigma_R$ | Strength

Fracture properties



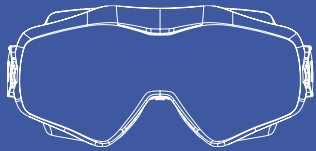
Fracture Toughness | Γ_c

Fracture Mechanics

Re-design driven by Sustainability

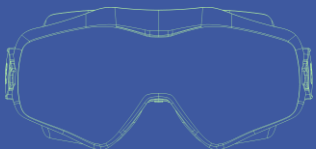
Starting point

Fossil-based

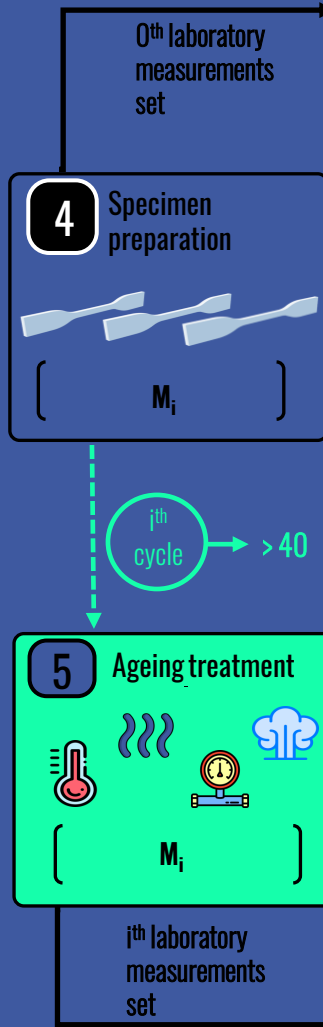


"Fossil-based polymer replacement"

Bio-based



End point

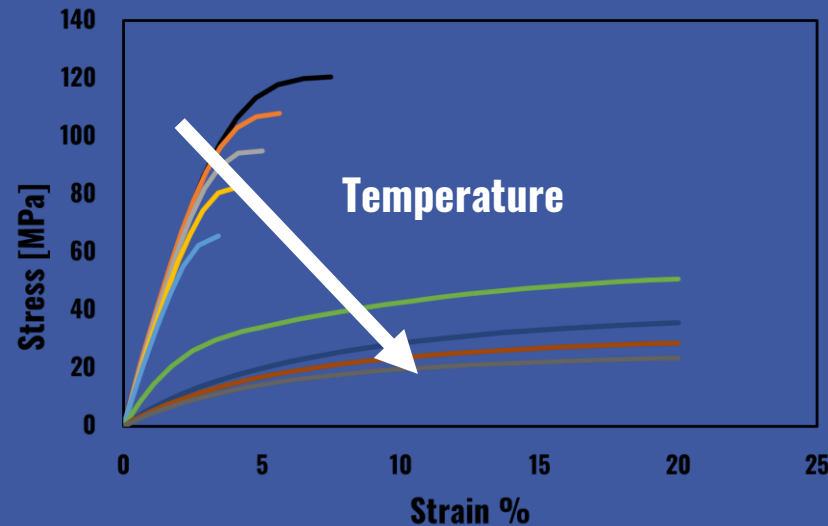


6

Laboratory measurements

Intrinsic Material Properties

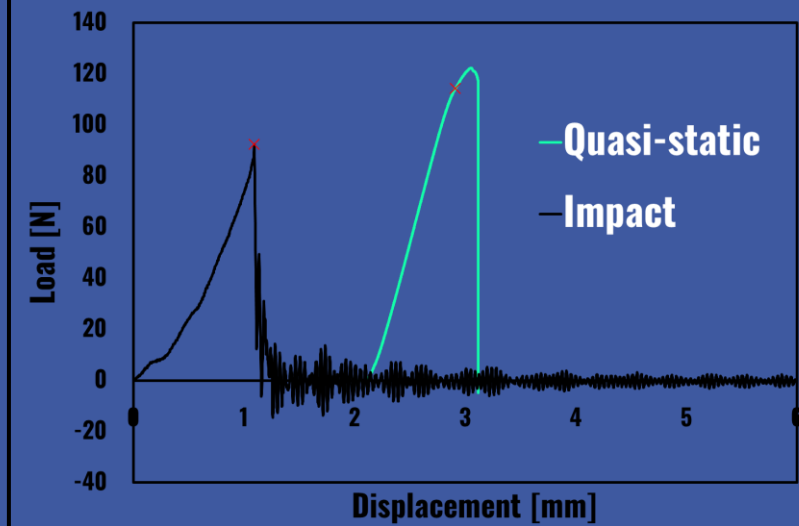
Tensile Test



Stiffness | E

$\sigma_y - \sigma_R$ | Strength

Fracture properties

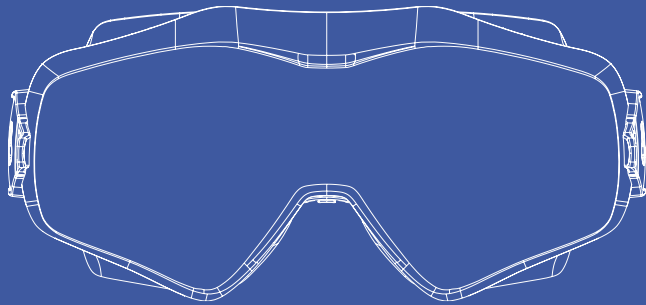


Fracture Toughness | Γ_c

Fracture Mechanics

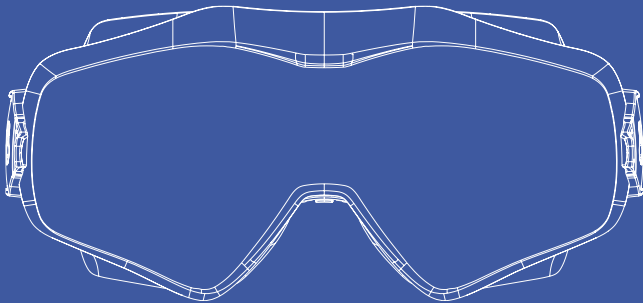


Fossil-based



non-renewable sources polymers

Product in use testing



Technological measurements

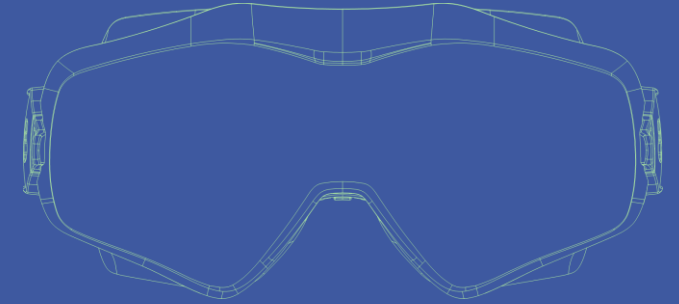
“Fossil-based polymer replacement”

Starting point

End point

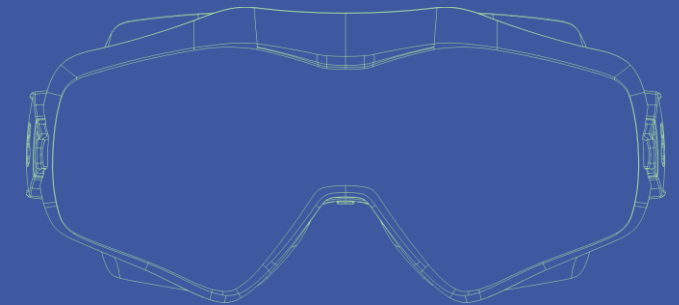
“Methodology development”

Bio-based



renewable sources polymers

Materials testing



Intrinsic material properties



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