



GEO_DICT® ALS WERKZEUG DER TEXTILEN INNOVATION

1. Symposium der Fraunhofer Allianz Textil
Smarte Textilien in Strukturbauteilen

Dr. Christine König, Personal- und Organisationsentwicklung
Dr. Andreas Wiegmann, Dr. Constantin Bauer

- 1 Math2Market – Background Information and Company Overview
- 2 The Textile Production Chain and Contributions by GeoDict® as a Innovative Software Solution
- 3 Summary and potential next Steps

THE GEODICT WORKFLOW

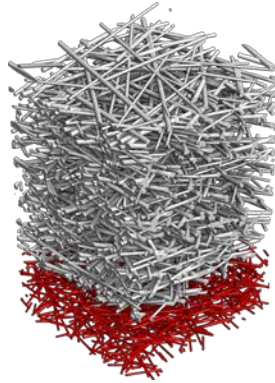
GEODICT

IMPORT



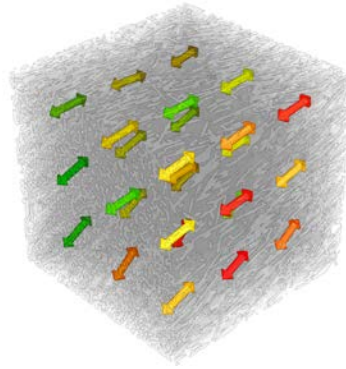
Diverse ways to import materials for modeling

MODEL



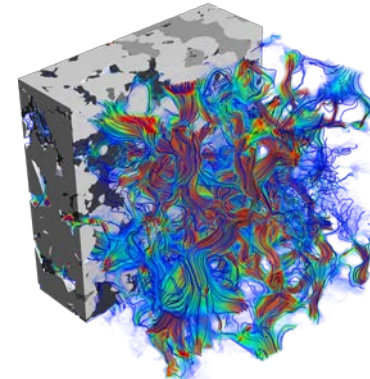
Detailed material models created in 3D

ANALYZE



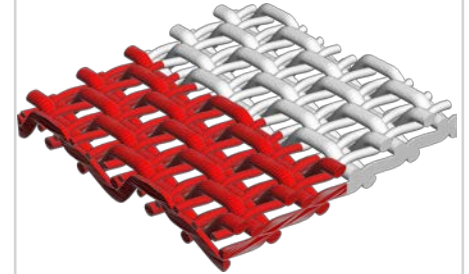
Extensive analysis and evaluation of structural material properties

PREDICT



In-depth analysis and prediction of material behavior

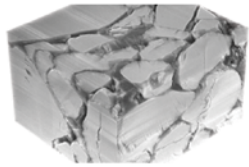
EXPORT



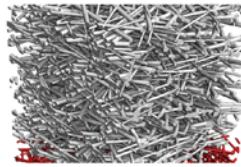
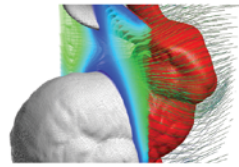
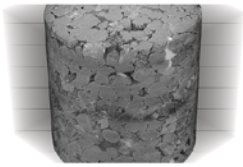
GeoDict models made available for standard workflows

GEODict MODULE OVERVIEW

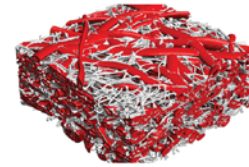
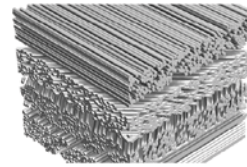
GEODict



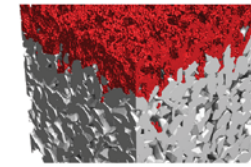
IMPORTGEO



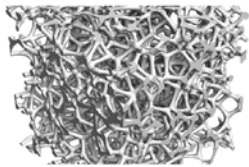
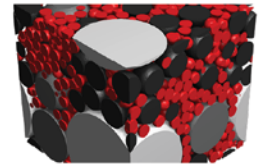
FIBERGEO



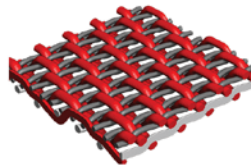
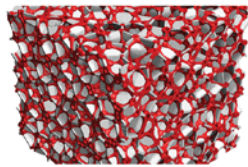
PAPERGEO



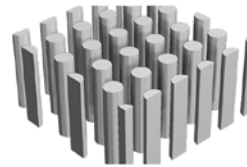
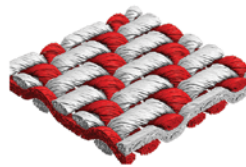
GRAINGEO



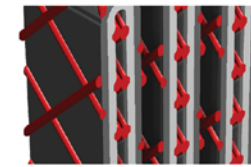
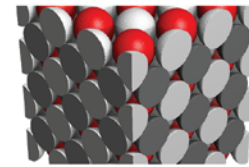
FOAMGEO



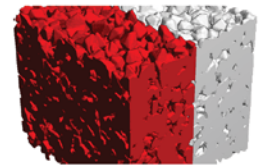
WEAVEGEO



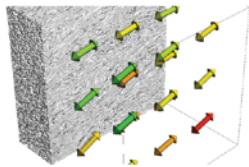
GRIDGEO



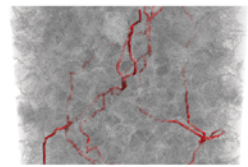
PLEATGEO



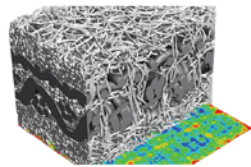
EXPORTGEO



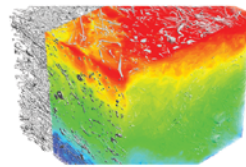
FIBERGUESS



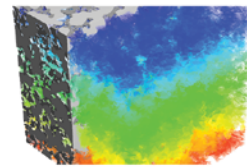
PORODICT



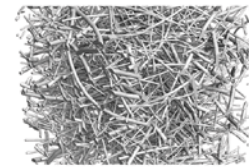
MATDICT



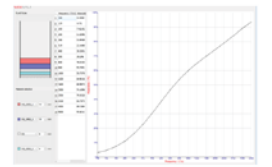
CONDUCTODICT



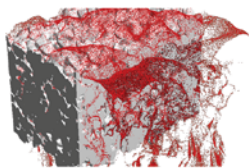
DIFFUDICT



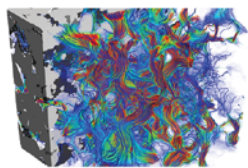
ELASTODICT



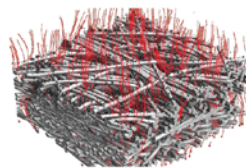
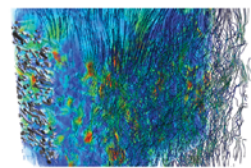
ACOUSTODICT



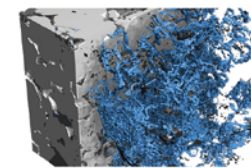
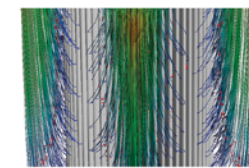
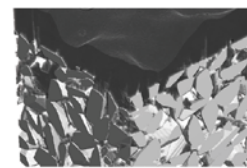
ADDIDICT



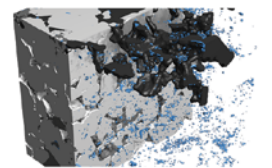
FLOWDICT



FILTERDICT MEDIA & ELEMENT



SATUDICT



OUR FOCUS IS ON THE CLIENT



Filtration

Mostly automotive, filter media & filters for water, sludge, oil, air and fuel

Electrochemistry

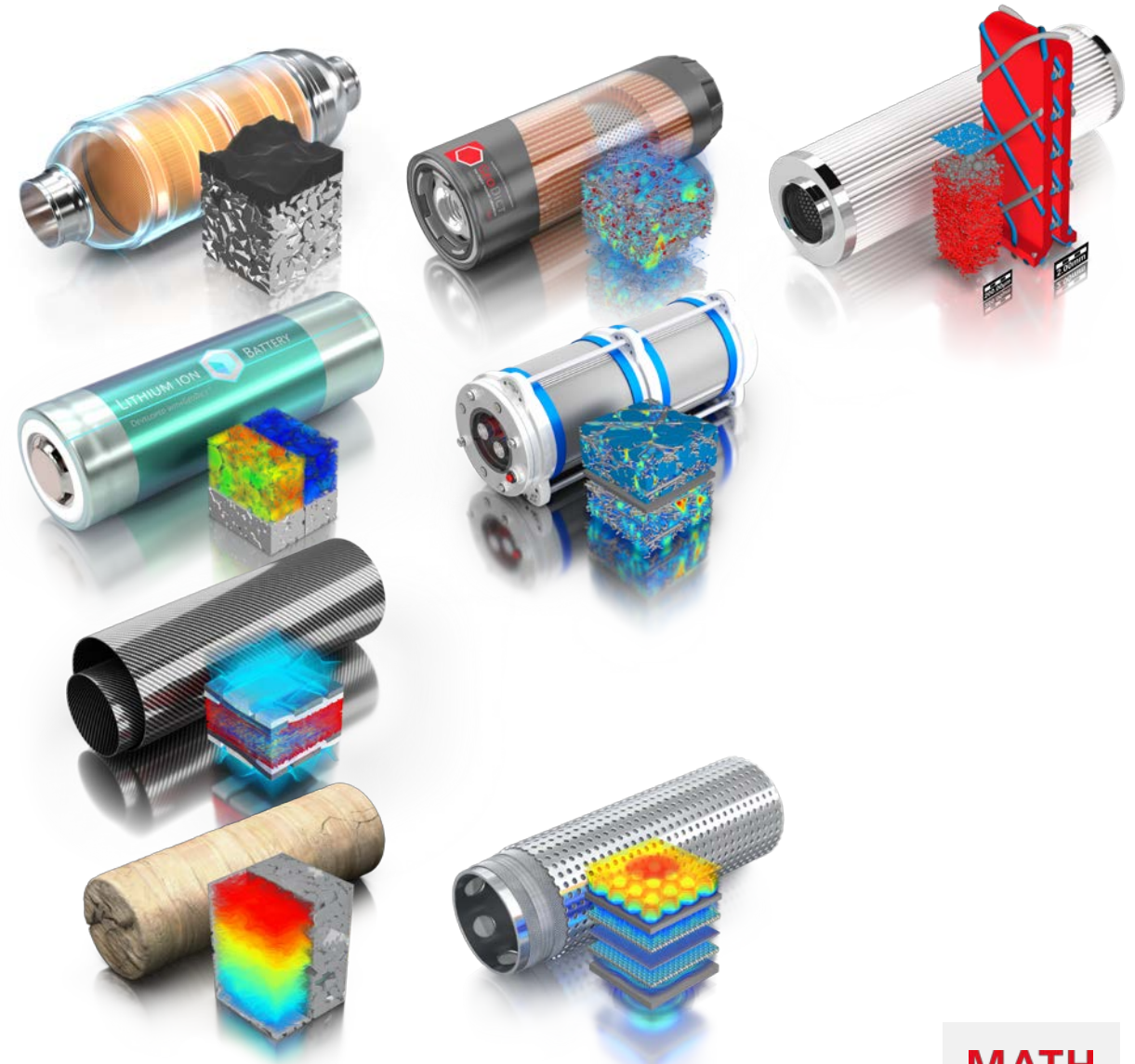
Fuel cell media & battery materials, catalyst materials

Composites, Metals & Ceramics

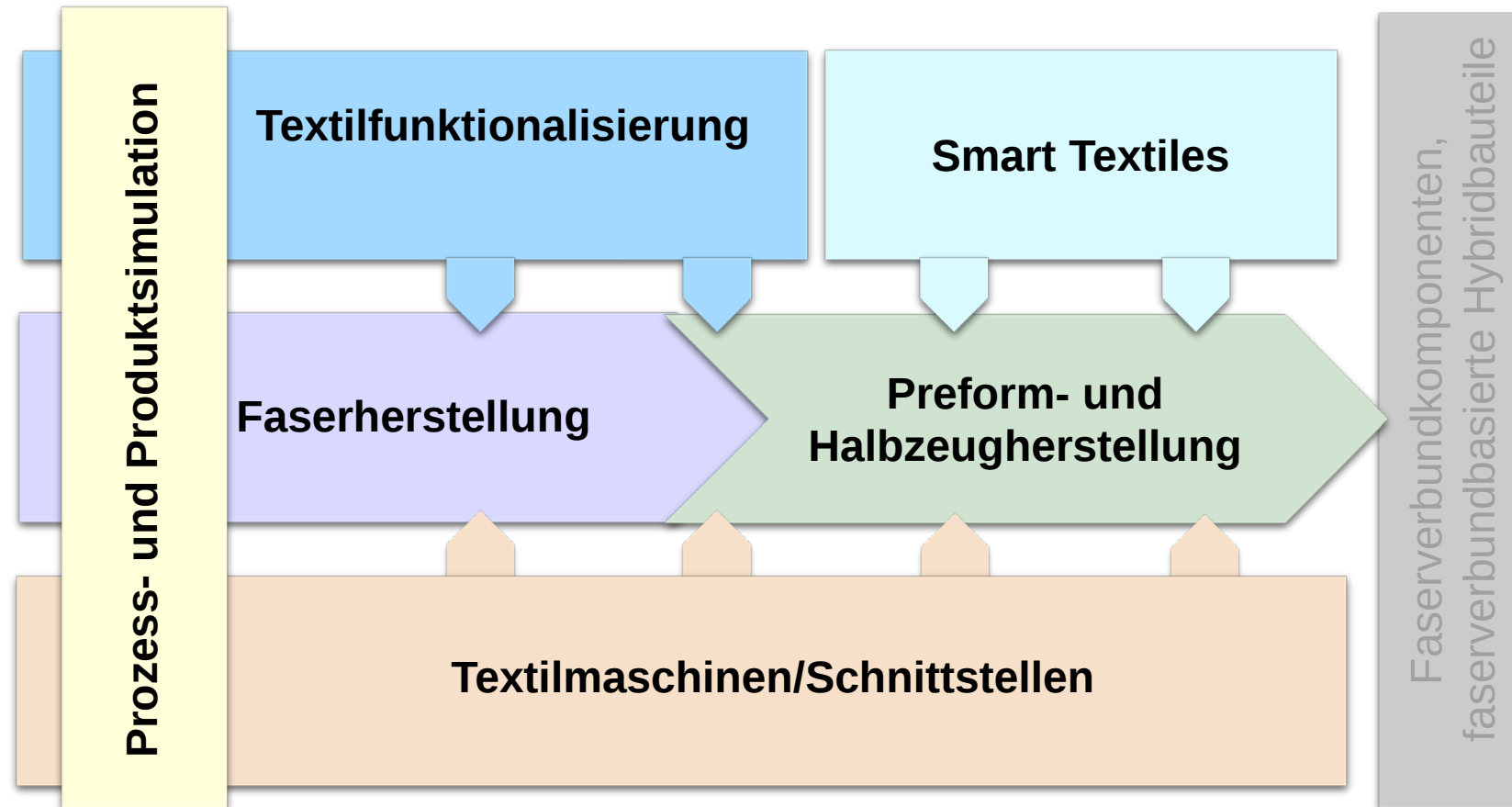
CFRP, GFRP, mostly automotive, lightweight materials

Digital Rock Physics

Digital rock physics, digital sand control

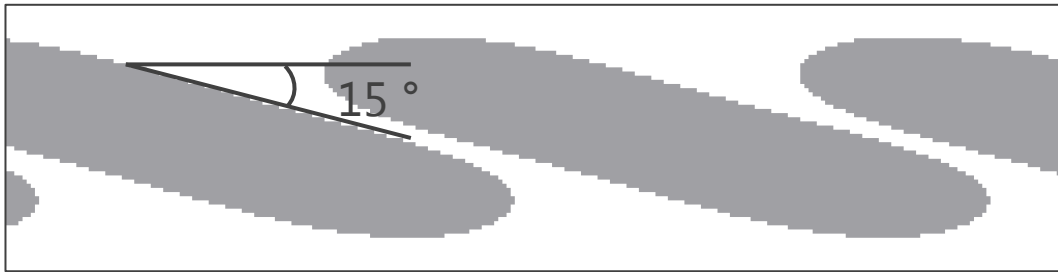


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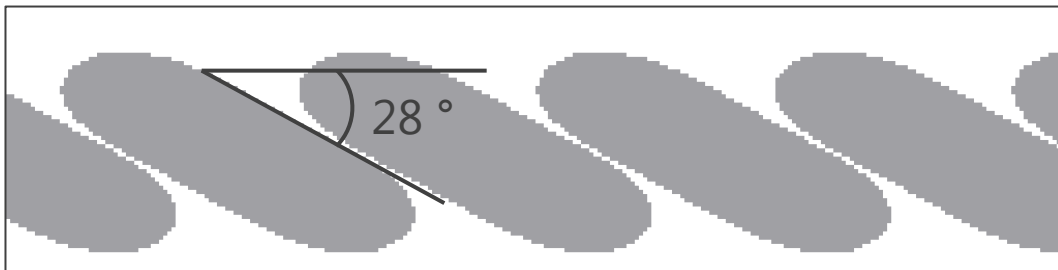


STUDIES ON A TWISTED YARN

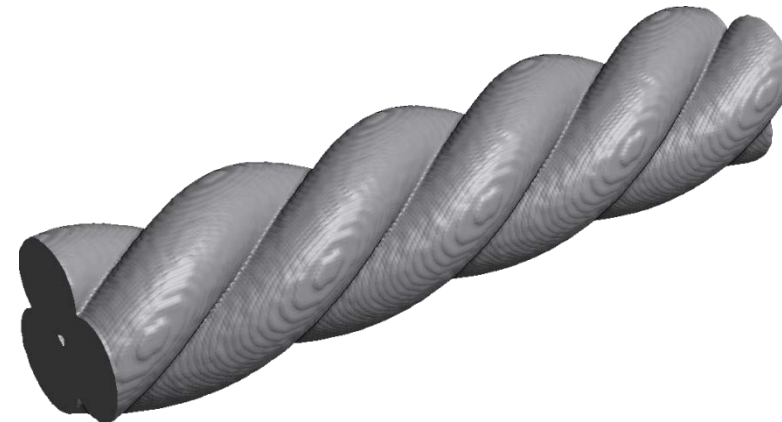
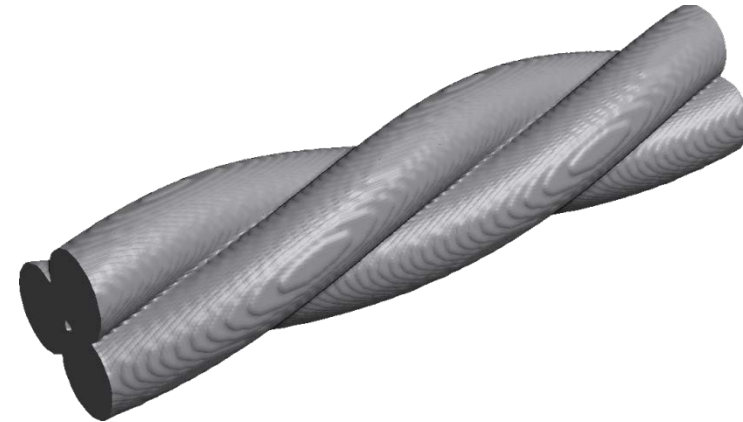
What influence has the number of twists per length (twist angle) on the stiffness and strength?



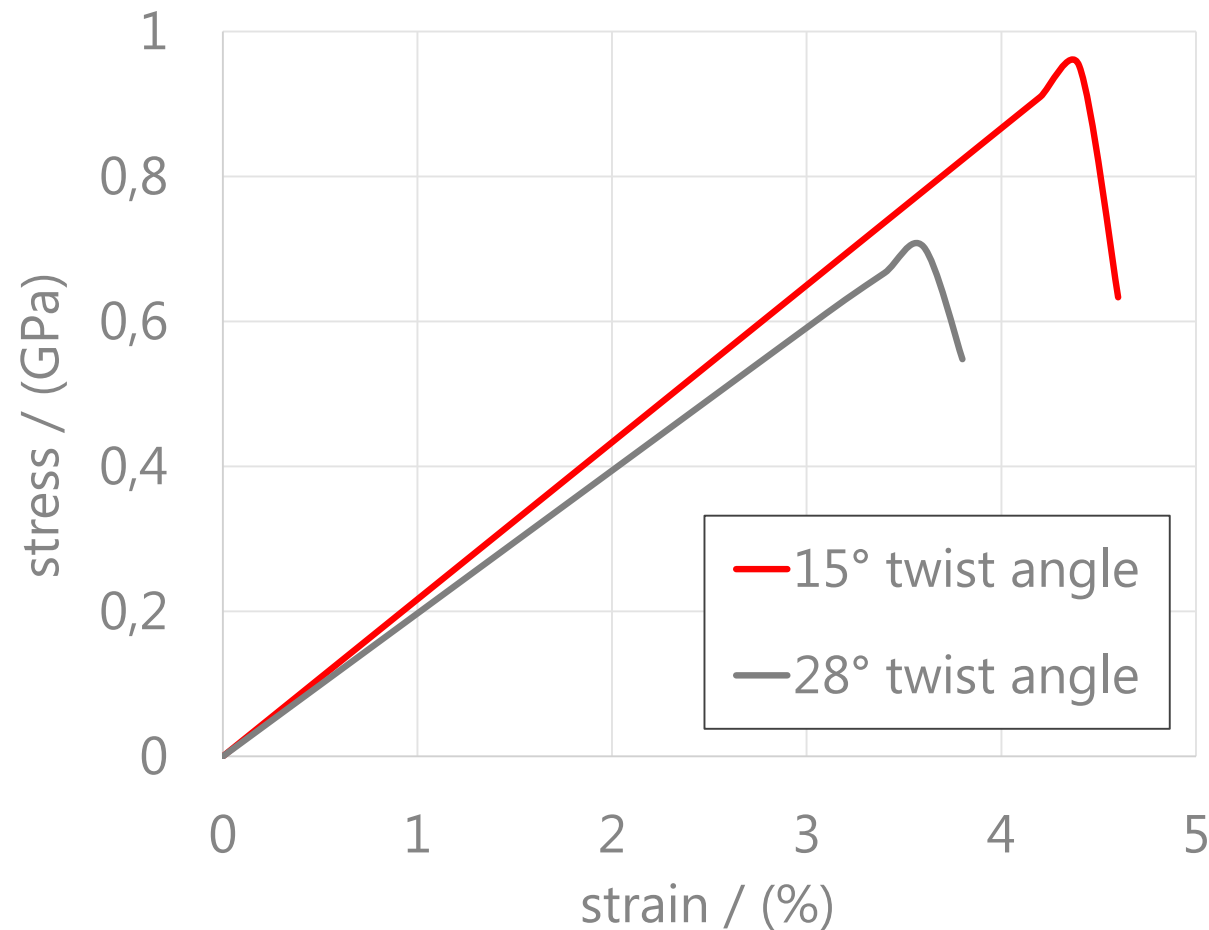
cross-section of the model with 15° twist angle



cross-section of the model with 28° twist angle



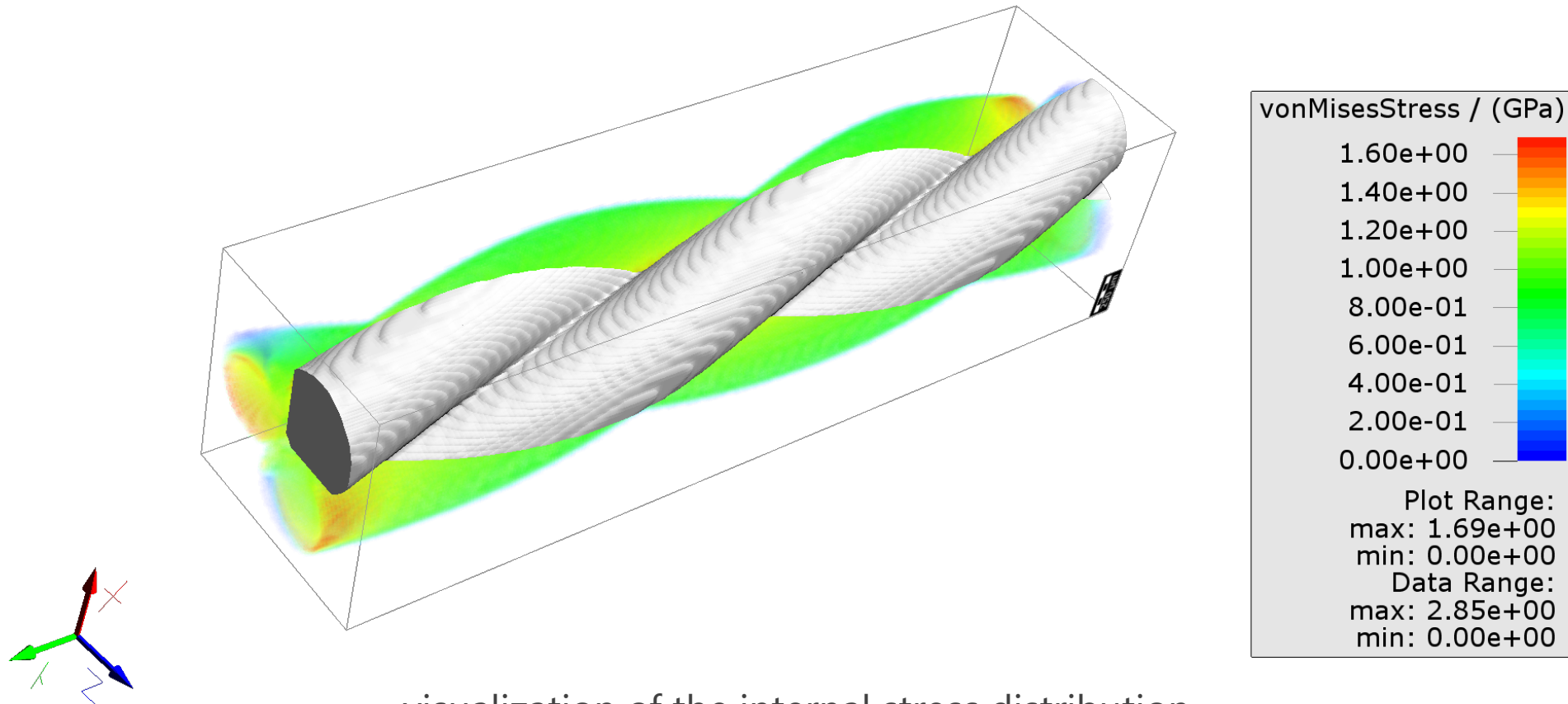
What influence has the twist angle on the stiffness and strength?



Change in Property from 15° to 28°

Stiffness	-9.1 %
Strength	-26,2 %
Tenacity	-18,2 %

What influence has the twist angle on the stiffness and strength?



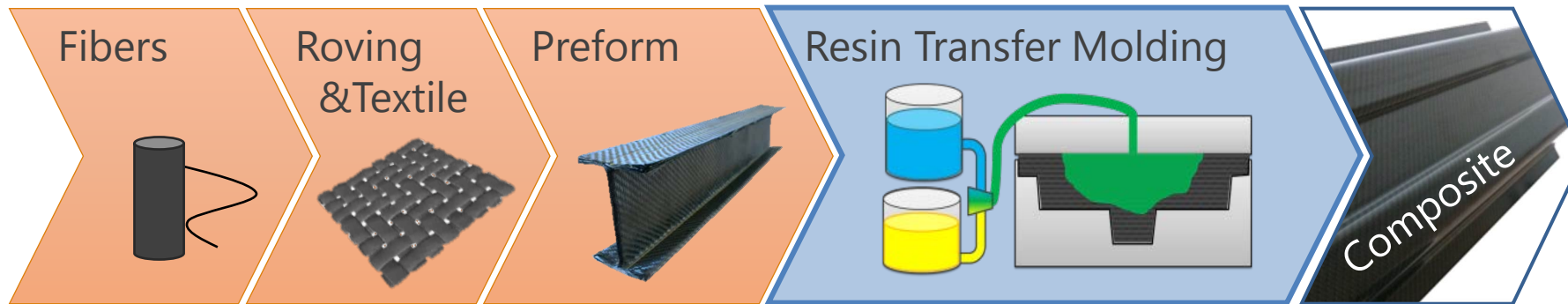
visualization of the internal stress distribution

STUDIES ON PERMEABILITY (ZIM-PROJECT)

In cooperation with Tim Schmidt from IVW GmbH

Wir bedanken uns für die Förderung des Projektes **Math2Composites** im Rahmen des
"Zentralen Innovationsprogramms Mittelstand" durch das BMWI

Permeability is the crucial process parameter for Resin Transfer Molding



Darcy's law:

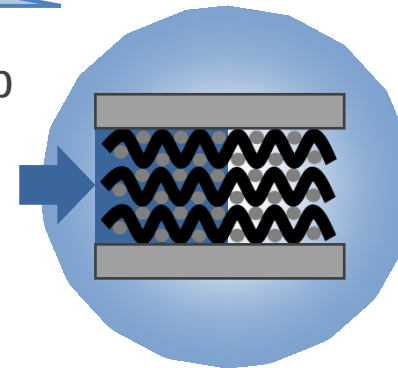
Permeability — $v = -\frac{K}{\eta} \cdot \frac{\Delta P}{\Delta L}$

Flow velocity — v

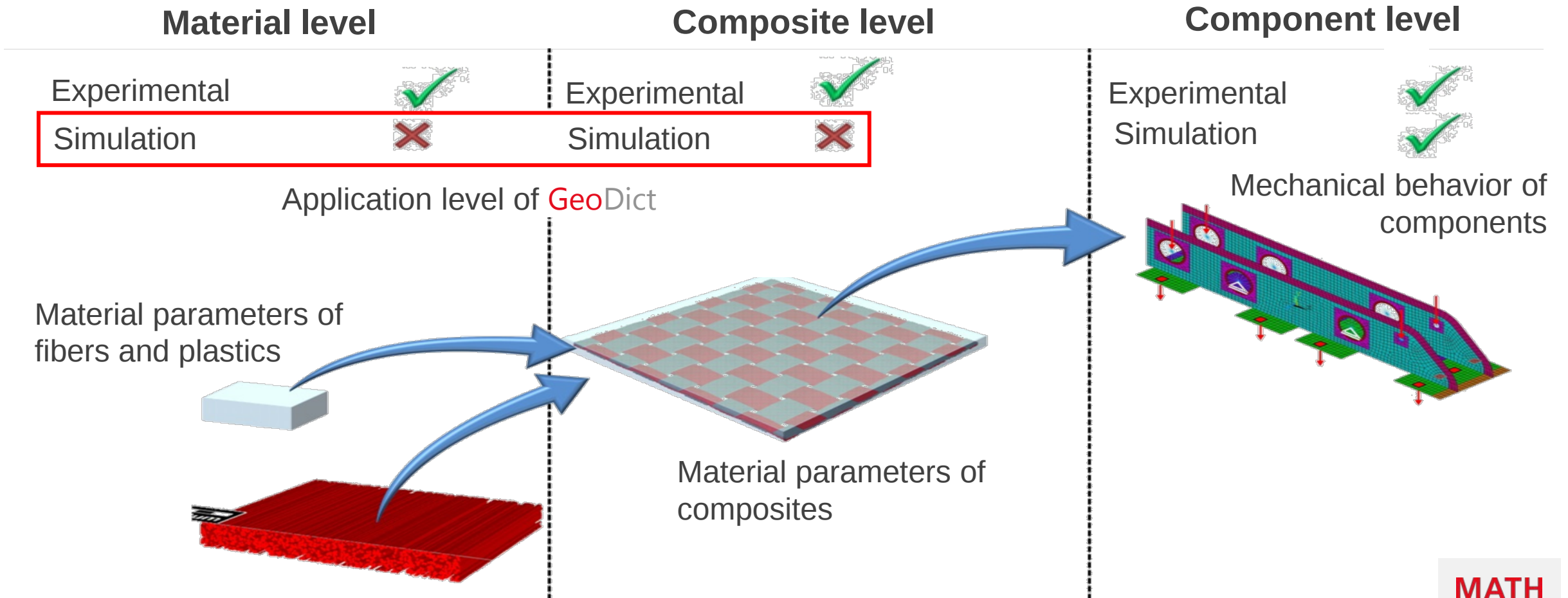
Fluid viscosity — η

Pressure drop — ΔP

Flow length — ΔL



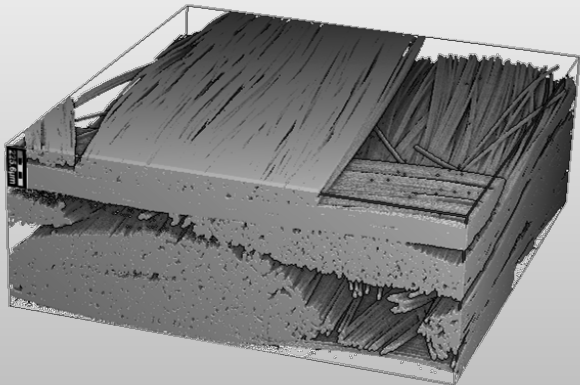
Closing the simulative gap with GeoDict to reduce the experimental effort



Example Hacotech G300U-1270 mm glass fiber textile

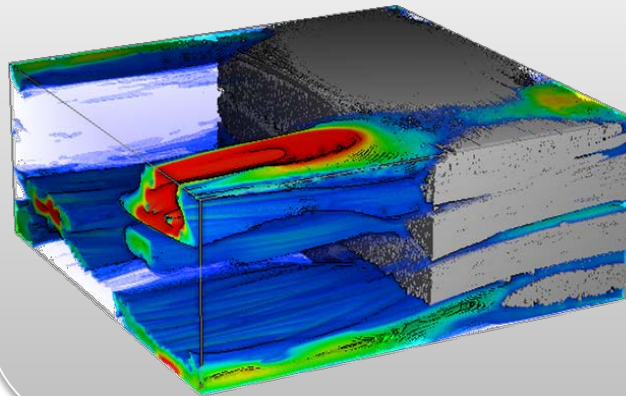
ImportGeo

Import the μ CT-Scan

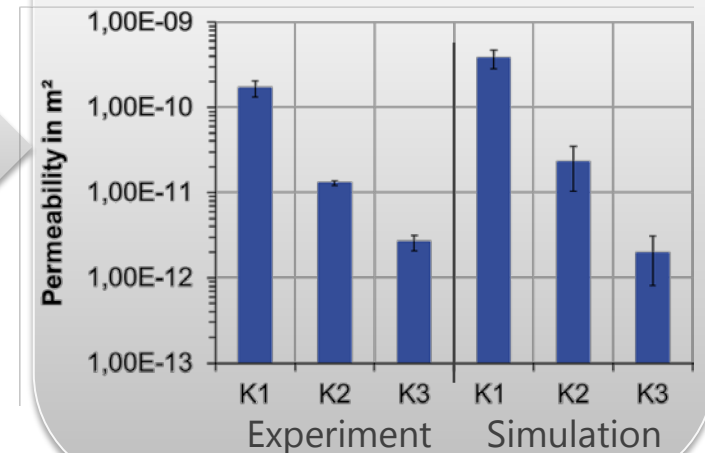


FlowDict

Permeability calculation

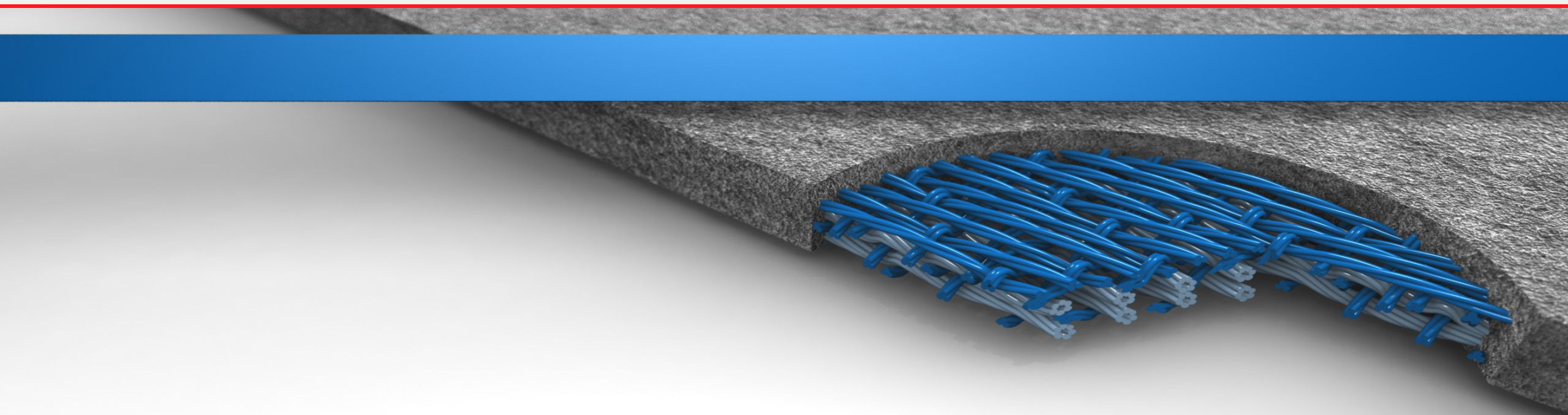


Validation



DEVELOPMENT OF PAPER DEWATERING FELT

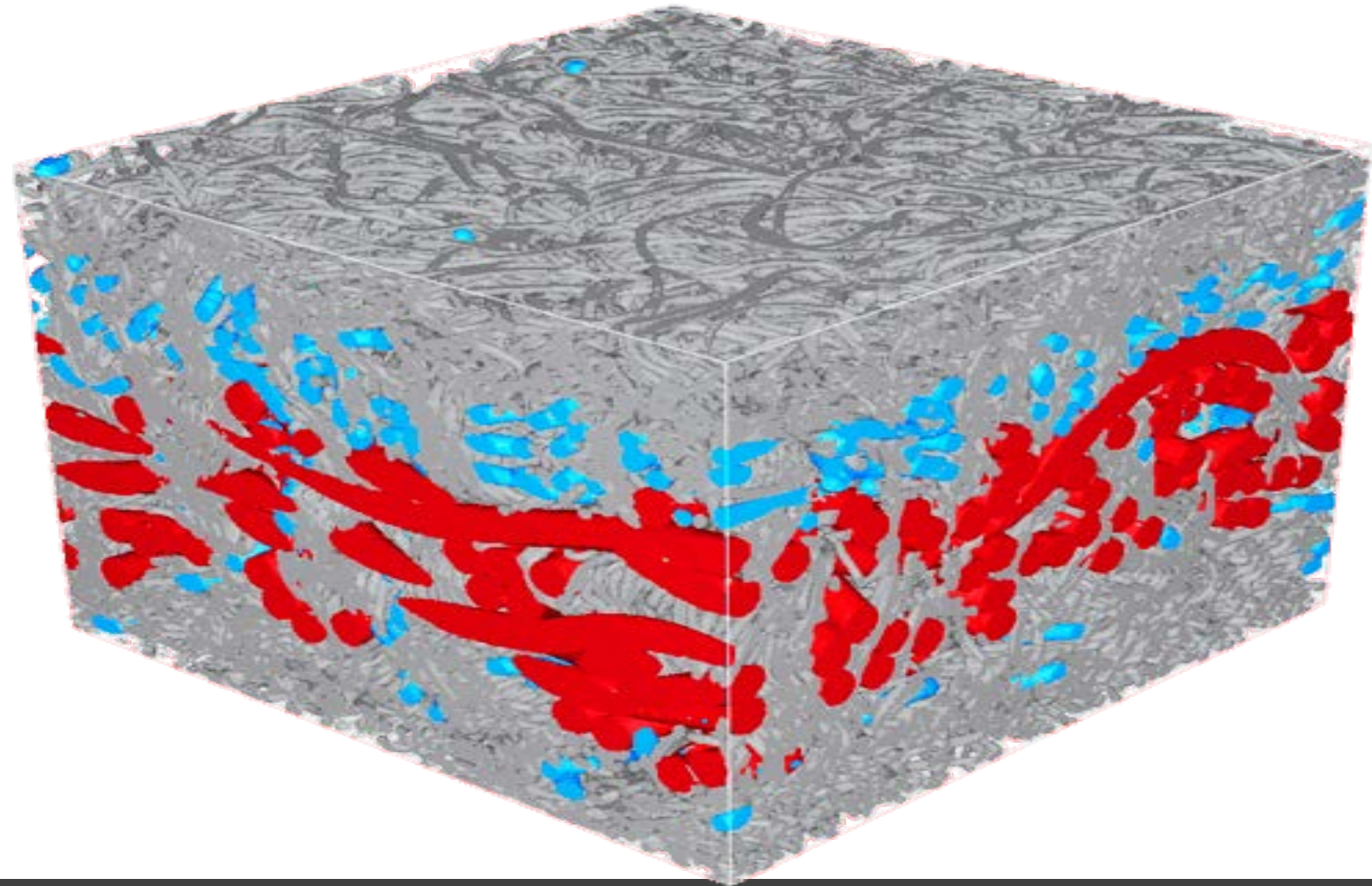
DESIGN OF A DEWATERING FELT



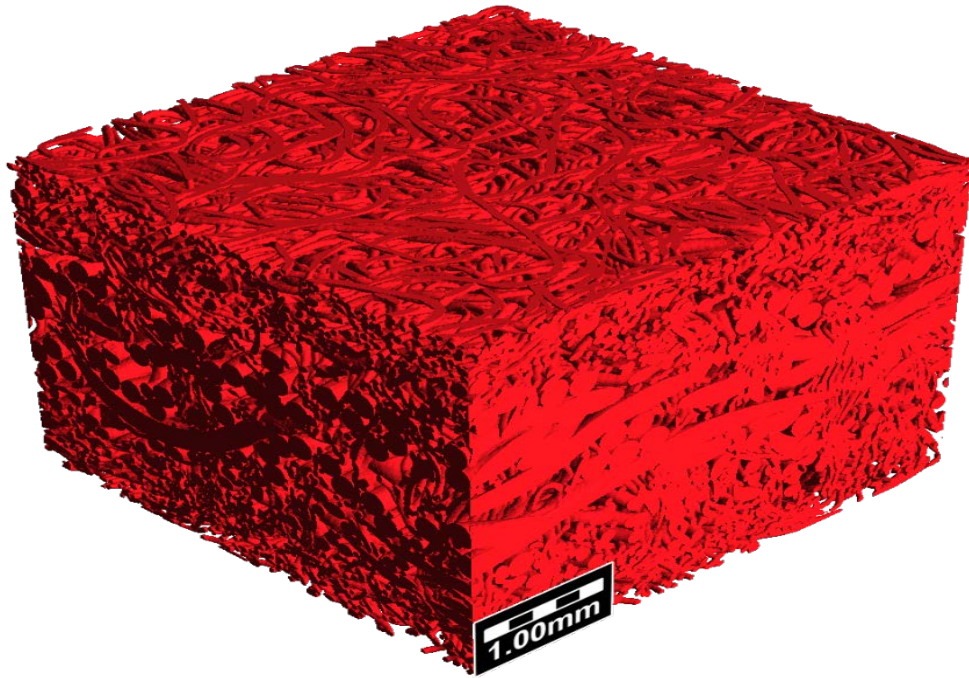
Courtesy of Huyck.Wangner Germany GmbH

BILDERKENNUNG AUS SCAN VON GRUNDGEWEBE, DICKEN UND DÜNNEN FASERN

GEODict



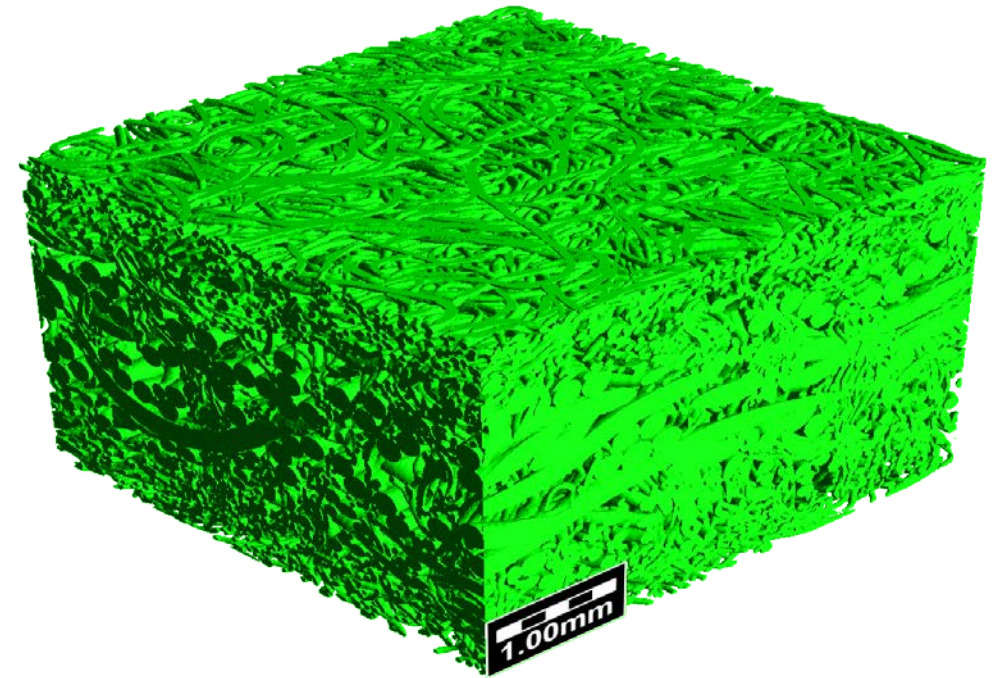
Nutzen Sie die rekonstruierte Struktur für GeoDict Simulationen



Scan Probenkörper

547 x 546 x 410 Voxel

0% Deformation



FeelMath = Probenkörper (Start Simulation)

547 x 546 x 410 Voxel

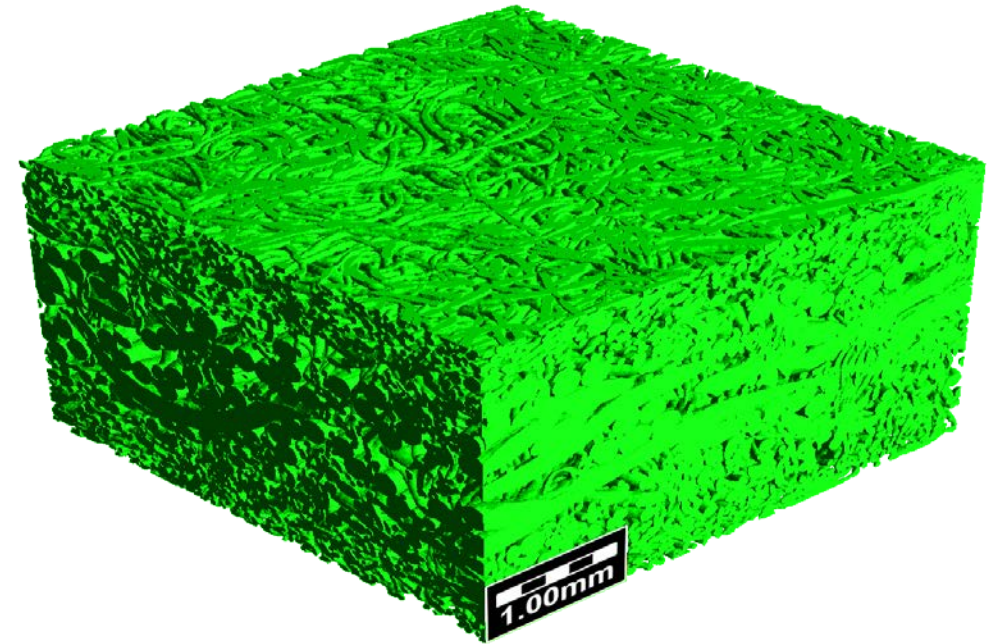
0% Deformation



Scan Probenkörper

547 x 546 x 358 Voxel

-12.68% Deformation



FeelMath Simulation

547 x 546 x 358 Voxel

-12.68% Deformation

KOMPRESSION @ 2.0 MPa

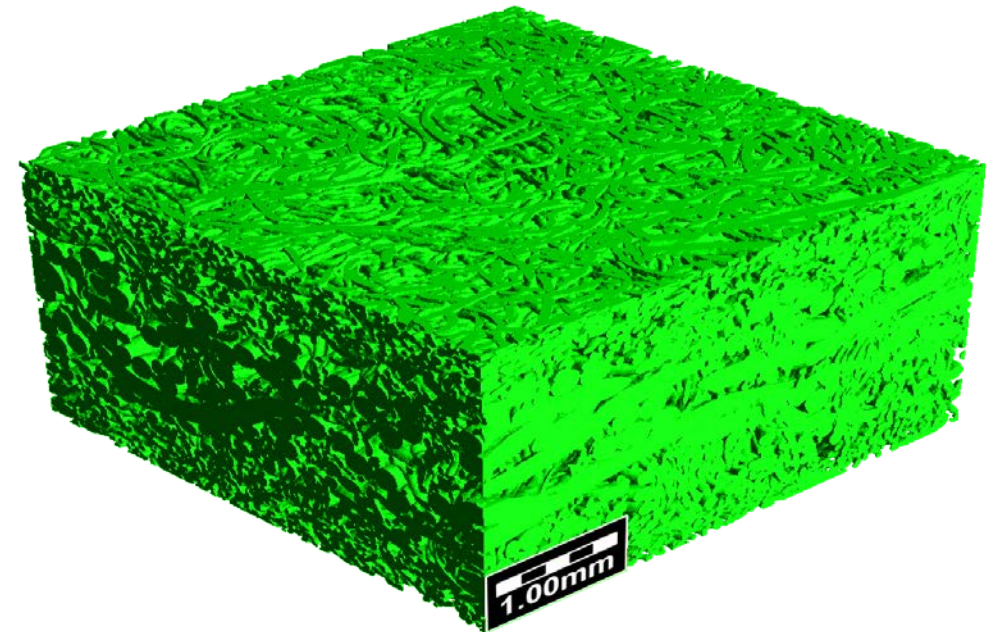
GEODict



Scan Probenkörper

547 x 546 x 341 Voxel

-4.75% Deformation



FeelMath Simulation

547 x 546 x 341 Voxel

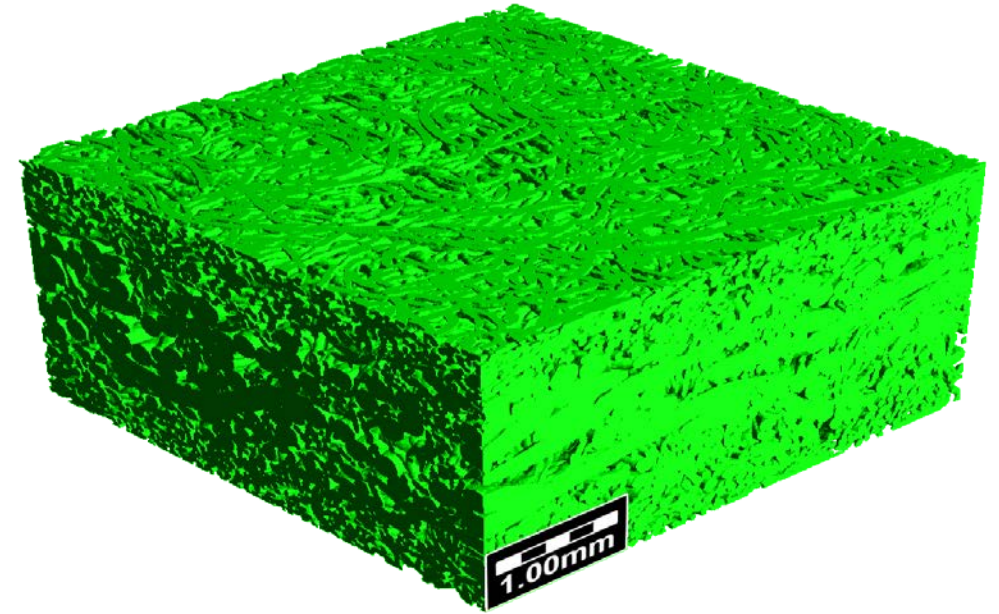
-4.75% Deformation



Scan Probenkörper

547 x 544 x 314 Voxel

-7-92% Deformation



FeelMath Simulation

547 x 544 x 314 Voxel

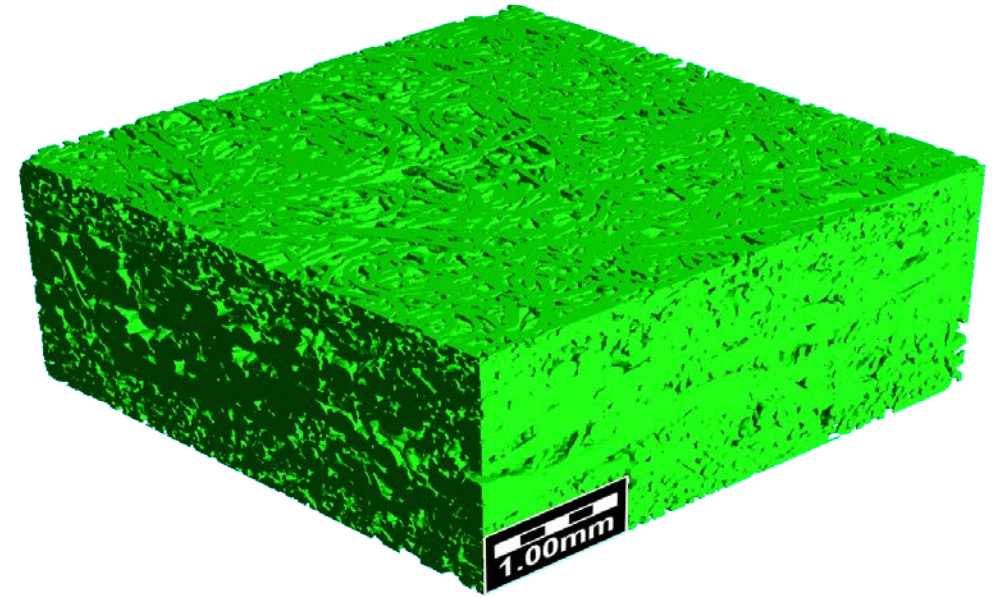
-7.92% Deformation



Scan Probenkörper

547 x 544 x 290 Voxel

-7.46% Deformation



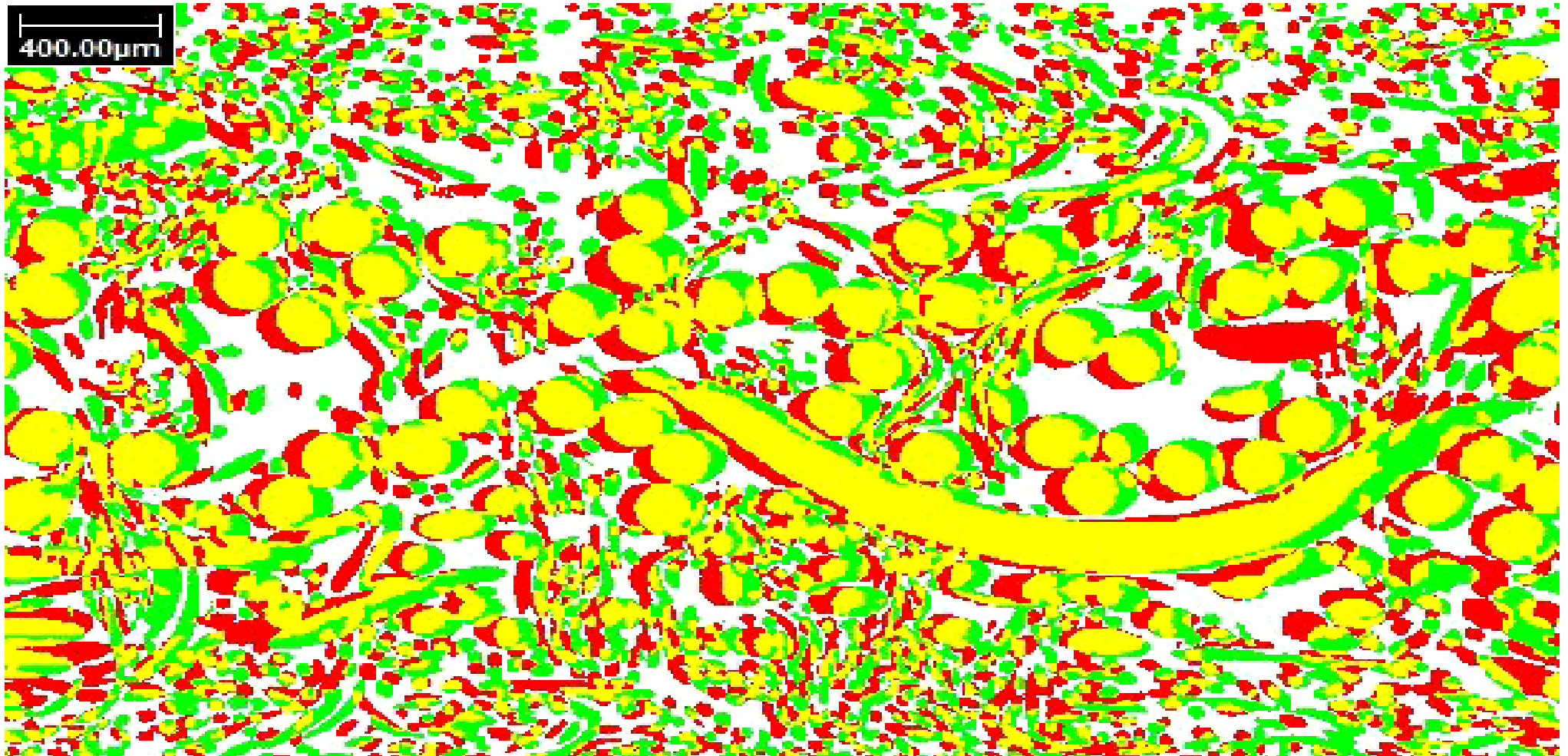
FeelMath Simulation

547 x 544 x 290 Voxel

-7.46% Deformation

VERGLEICH VON SCAN VS GEODICT @ 1.0MPa

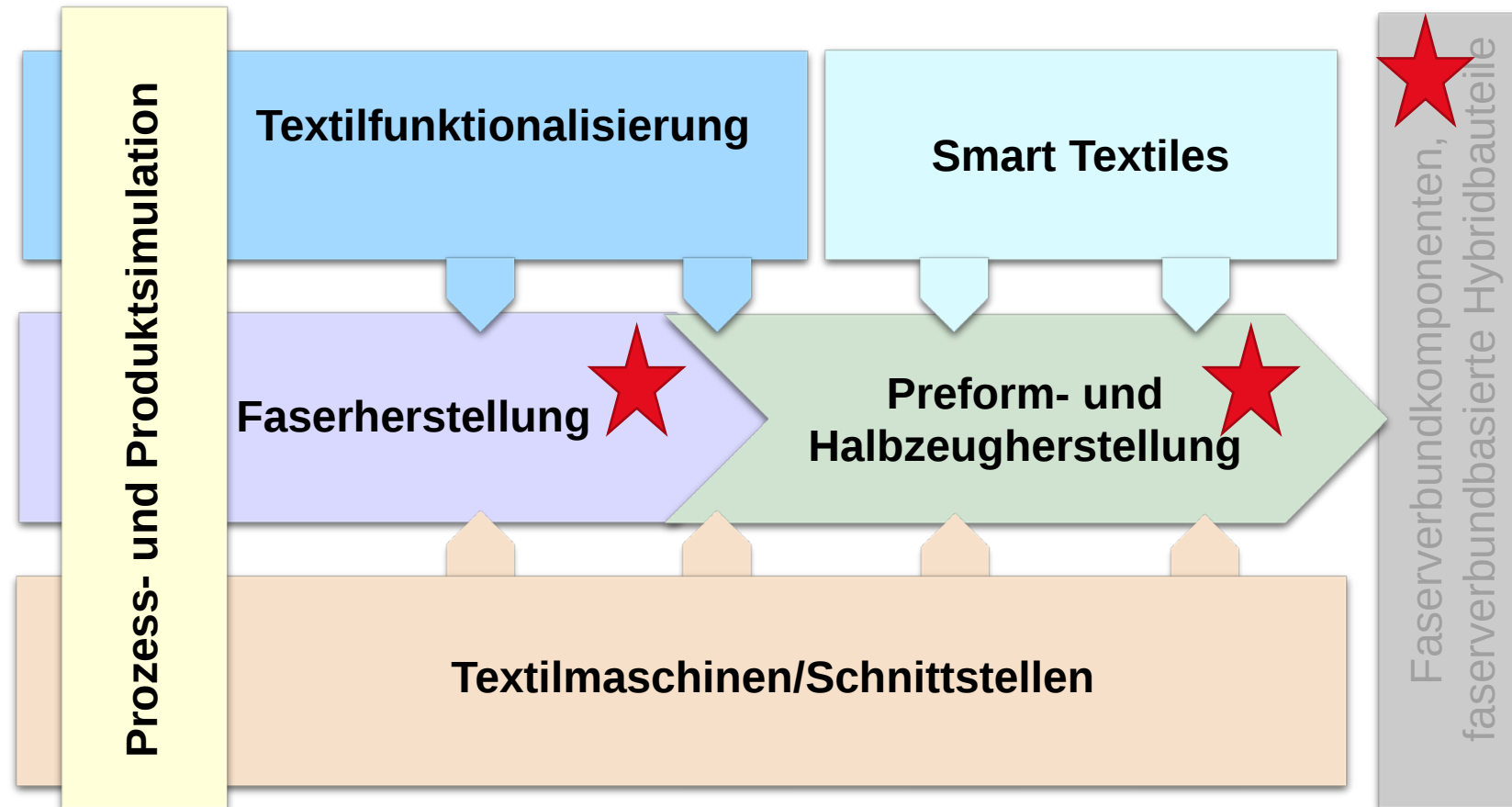
GEODICT



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DIE TEXTILE FERTIGUNGSKETTE

★ BEISPIELE FÜR DIE ANWENDUNG VON GEO_DICT®



Vielen Dank für Ihre Aufmerksamkeit!