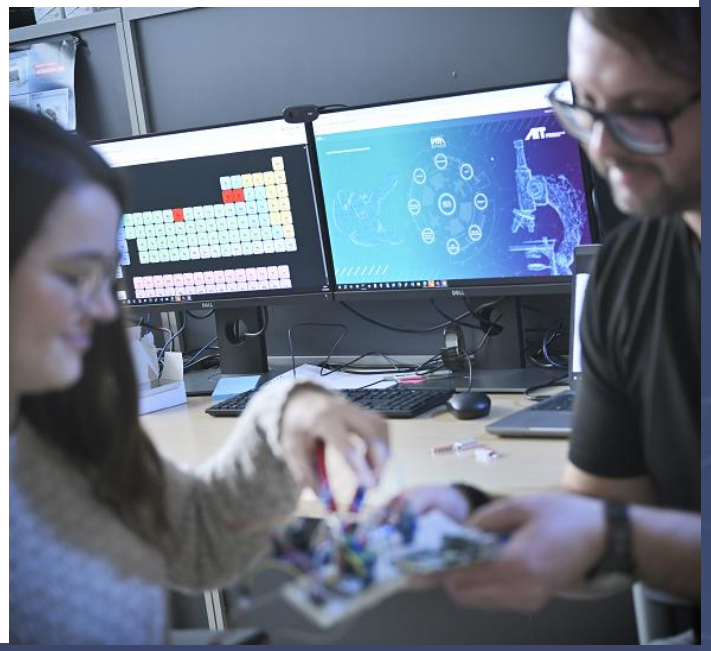
DI Dr.-mont. Carina Schlögl
LKR Leichtmetallkompetenzzentrum Ranshofen GmbH



Eco-Mobility 2025

Advanced Lightweight Materials for Future Mobility

AUSTRIAN INSTITUTE OF TECHNOLOGY
TOMORROW TODAY

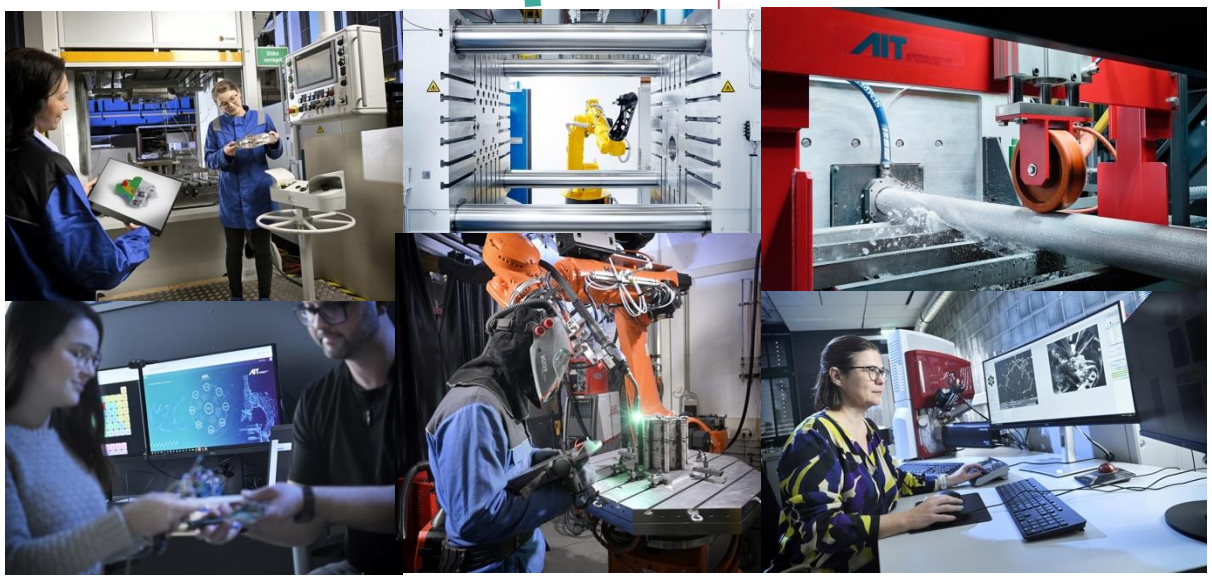
14.11.2025

WHO ARE WE?
LKR LIGHT METALS TECHNOLOGIES RANSHOFEN

- Subsidiary of the **AIT Austrian Institute of Technology** – Cener for Transport Technologies
- Located in Ranshofen/Braunau
- 70 employees

R&D for Al, Mg and Ti applications

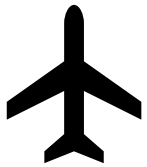
- Optimization & development of alloys / processes
- Casting, forming and additive manufacturing facilities on semi-industrial scale
- Simulation, digitalization, AI
- testing laboratory



WHY DO WE NEED ADVANCED LIGHTWEIGHT MATERIALS?

The role of lightweight materials in future mobility solutions is multifaceted and central to the transformation toward sustainable, efficient, and intelligent transportation systems.

Sustainability & Energy Efficiency



Performance & Range

Safety

Innovation & Integration

Economic Impact & Competitiveness

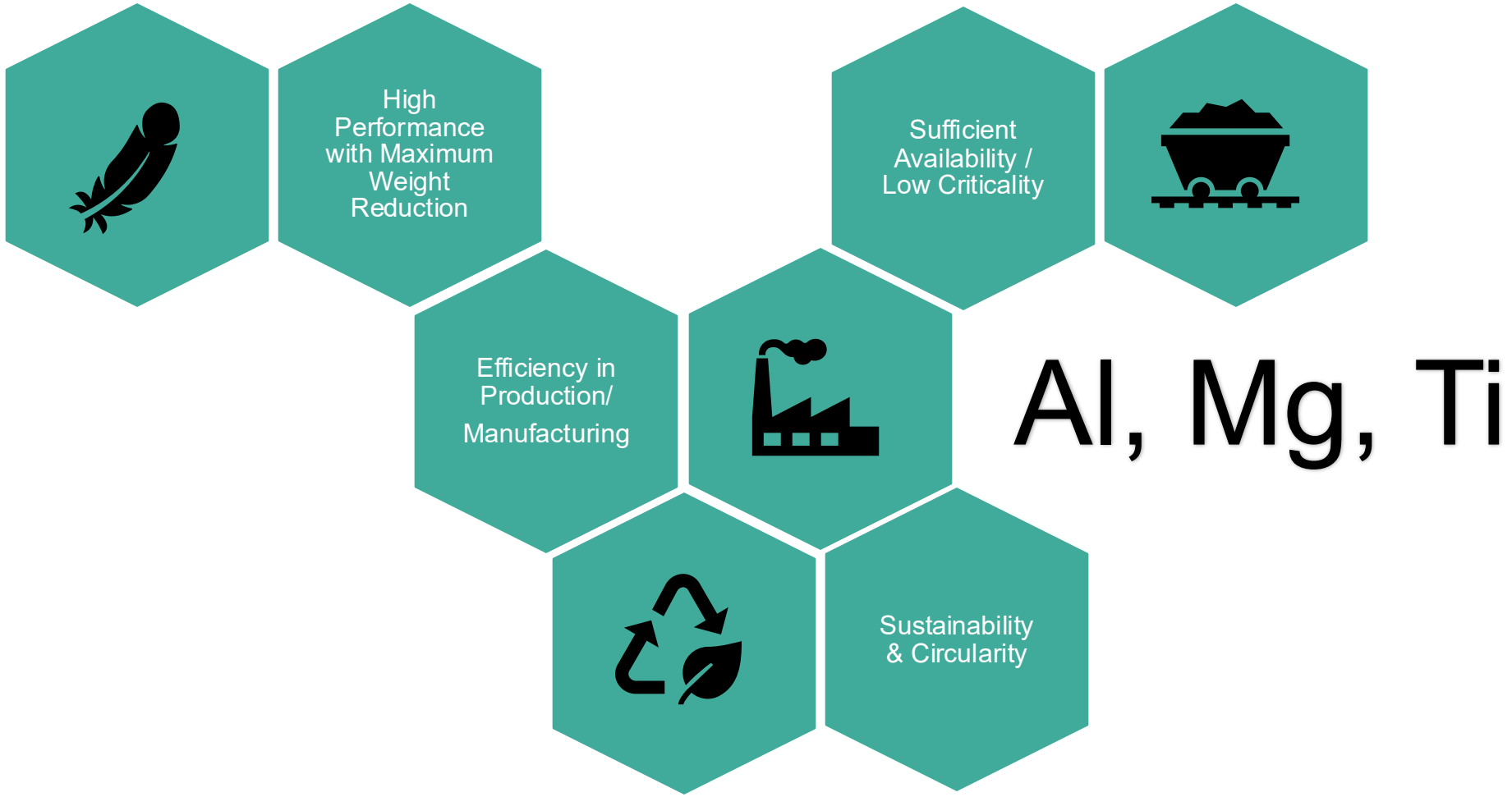
Future Perspectives

Impact of Lightweight Design on Austria

- Economic contribution: €20.3 billion total value creation
- Share of GDP: ~5% of Austria's economic output
- Jobs: 181,400 (direct + indirect)
- Key industries: automotive, aerospace, machinery
- Regional strengths: Upper Austria & Styria
- Export driver: High international competitiveness
- Sustainability: Lower material use, CO_2 reduction

„Die volkswirtschaftliche Bedeutung des Leichtbaus in Österreich", Studie, A2LT

WHAT QUALIFIES MATERIALS AS 'ADVANCED'?



HOW DO WE APPROACH THE DEVELOPMENT OF ADVANCED MATERIALS?

Combine

LIGHT & SUSTAINABLE MATERIALS

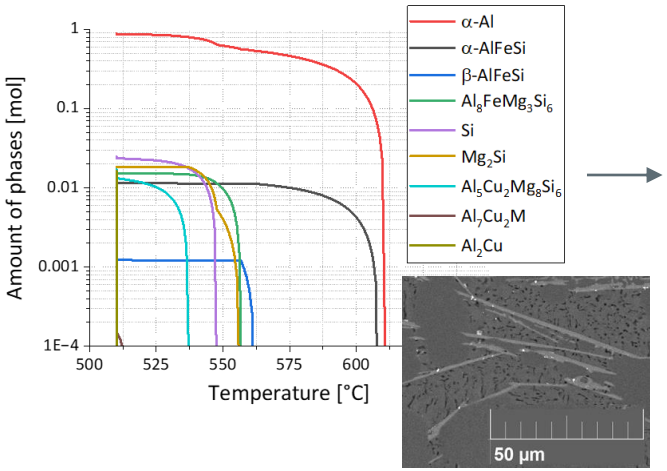
Alloy Design for Recycling

Tolerance engineering – design alloys that perform well despite impurities / low scrap qualities

Shift in paradigm: Adapt the alloy to the scrap – not the scrap to the alloy

Approach

1. Composition mapping
2. Modelling & Simulation
3. Alloy development
4. Experimental validation
5. Integration into industrial processes



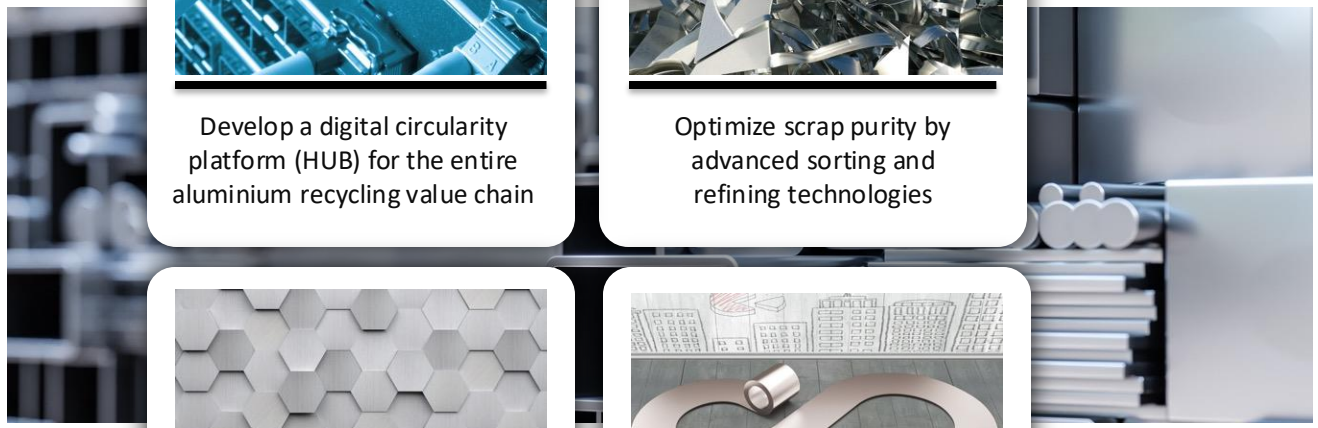
LIGHT & SUSTAINABLE MATERIALS

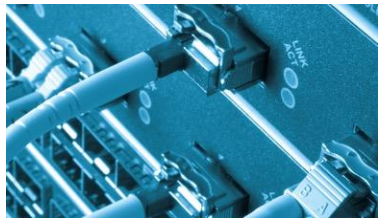
Alloy Design for Recycling

Tolerance engineering – design alloys that perform well despite impurities / low scrap qualities

RecAl 13

19 partners
10.9 M€ funding



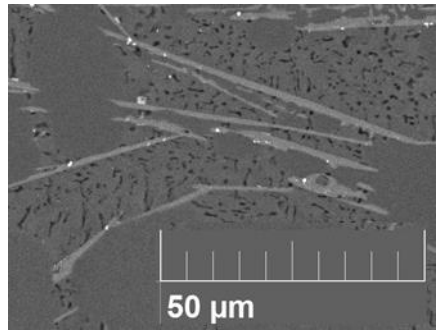


Develop a digital circularity platform (HUB) for the entire aluminium recycling value chain

Optimize scrap purity by advanced sorting and refining technologies

Maximizing the **impurity tolerance** of next-generation alloys

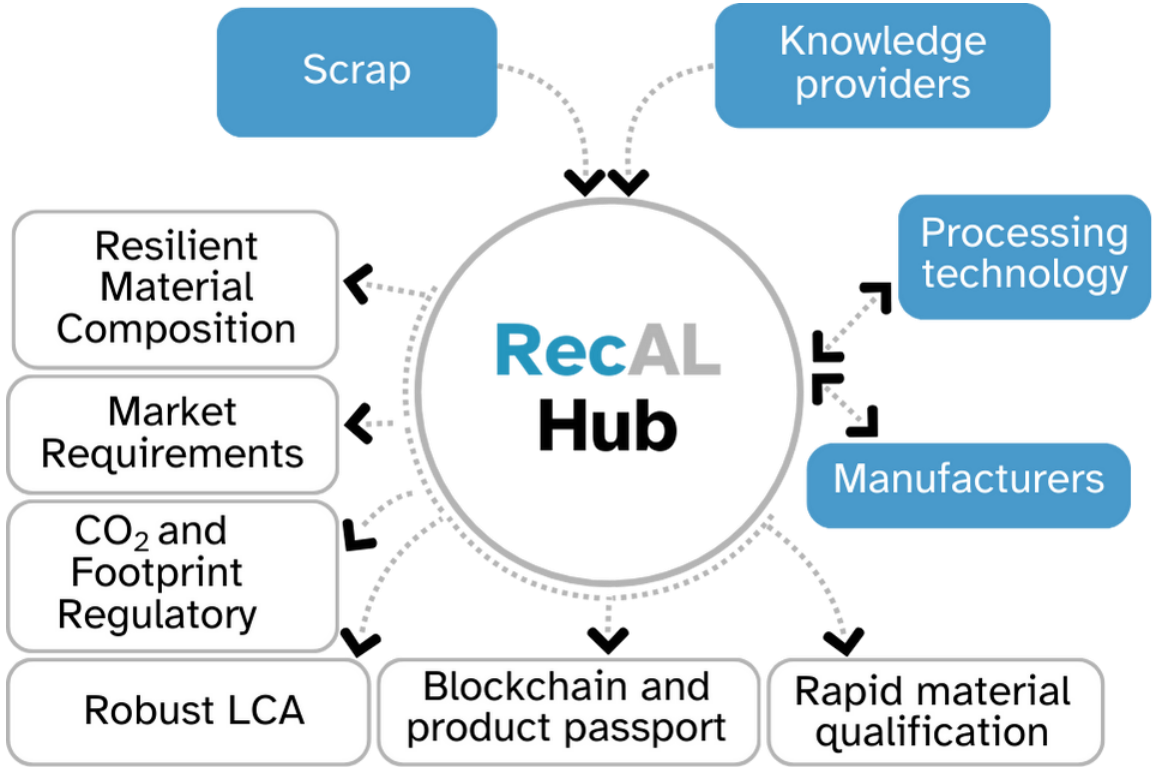
Provide data for **CO_2 footprint** and **product passport**

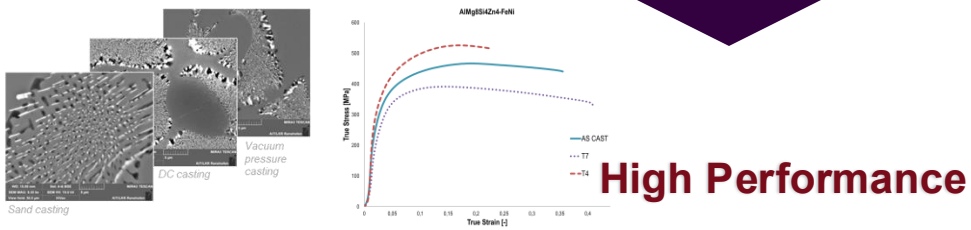


LIGHT & SUSTAINABLE MATERIALS

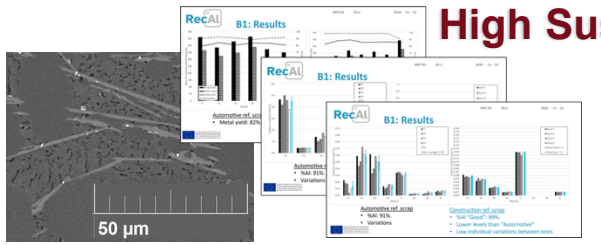
Alloy Design for Recycling

Tolerance engineering – design alloys that perform well despite impurities / low scrap qualities





High Performance

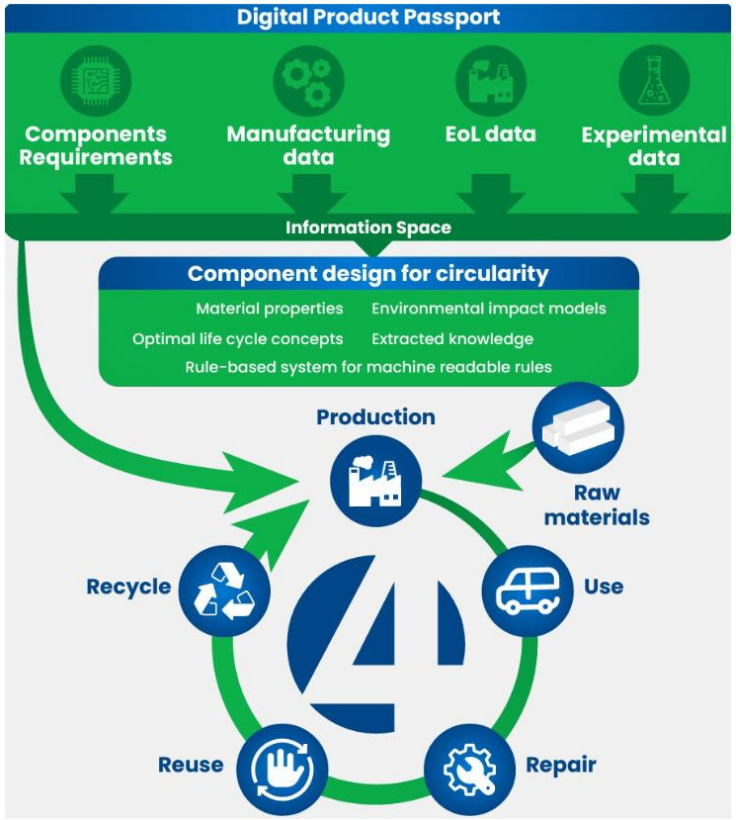


High Sustainability

LIGHT & SUSTAINABLE MATERIALS

Alloy Design for Recycling

Tolerance engineering – design alloys that perform well despite impurities / low scrap qualities



Goal:

Development of comprehensive digital platform to enable circular product development with focus on the automotive industry.

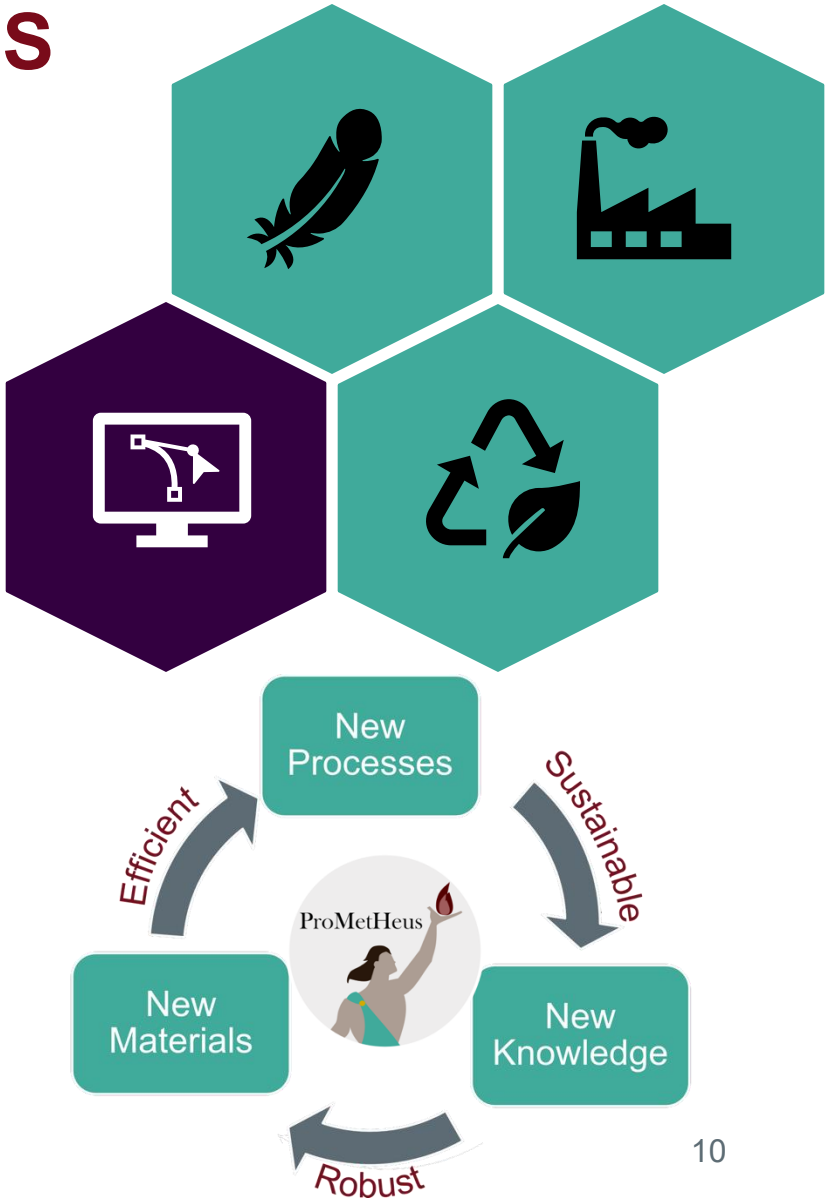
Key Features:

Automated Workflows, Machine Learning Algorithms, Life Cycle Data Integration, Environmental Impact Assessments, Digital Product Passport

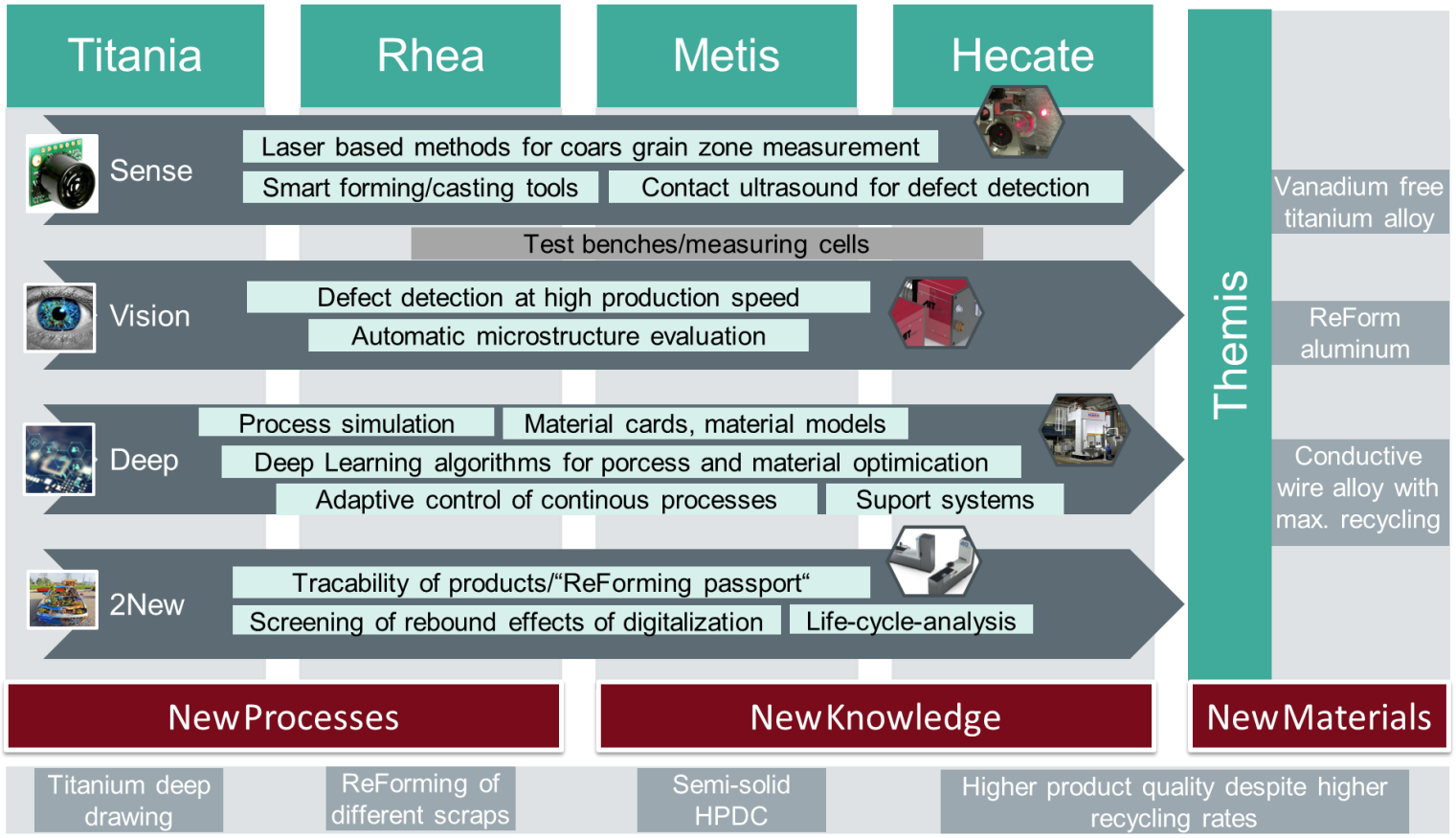
LIGHT METALS & EFFICIENT PROCESSES

ProMetHeus – digitalization of metallurgical processes to create **high-performance, energy-efficient, and sustainable production routes**.

- Improve efficiency, robustness, and sustainability in metal and plastics processing
- Develop innovative alloys and recycling concepts
- Enable energy-saving forming processes (e.g., titanium deep drawing)
- Support climate-neutral and competitive industry goals aligned with the European Green Deal



LIGHT METALS & EFFICIENT PROCESSES



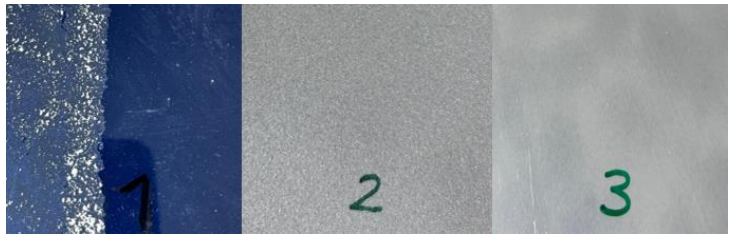
ProMetHeus

LIGHT METALS & SUSTAINABILITY „REFORMING“

Develop a **ReForming** process to reuse scrap and automotive/aircraft components without remelting.

Objectives:

1. **In-House Scrap:** Optimize materials and analyze faults.
2. **End-of-Life Scrap:** Assess properties and create processing roadmaps.
3. **Product Chain:** Ensure data transfer and plan for next life cycles.



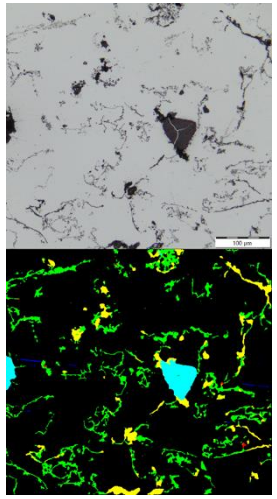
LIGHT METALS & EFFICIENT PROCESSES
INNOVATIVE TITANIUM FORMING

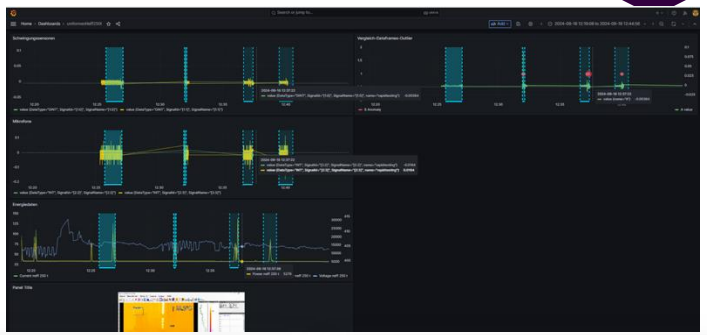
- **Challenge**: Conventional SPF → 840–930 °C, high energy, α-case formation.
- **Innovation:**
  - Hot deep-drawing below 500 ° C.
  - Reduced energy use and tooling costs.
  - Avoids α-case → better surface quality.
- **Results:**
  - Depth up to 68.5 mm, elongation >10%.
  - No additional heat treatment required.
- **Impact:**
  - CO_2 reduction, cost savings.
  - Patent applications filed.
  - Applications: Aerospace & high-performance lightweight components.

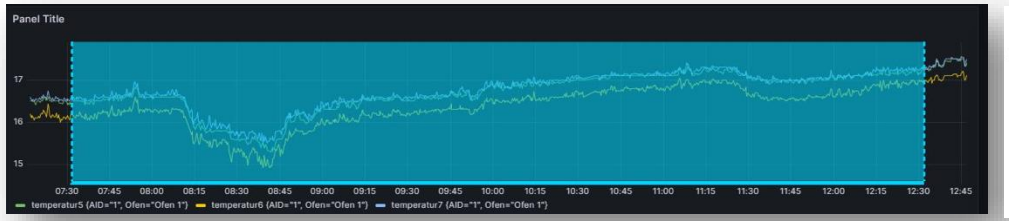
Only 2% of the energy consumption compared to the global state of the art (SPF – Superplastic Forming)
1.5 MJ/kg vs. 50–80 MJ/kg

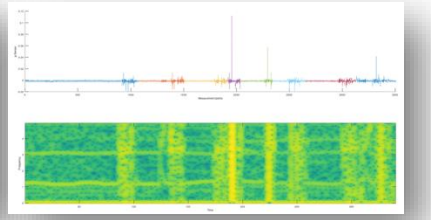
LIGHT METALS & EFFICIENT PROCESSES
DIGITALIZATION / PROMETTOOLS

- ProMet-Vision
- ProMet-Sense
- ProMet-Deep
- ProMet-2New



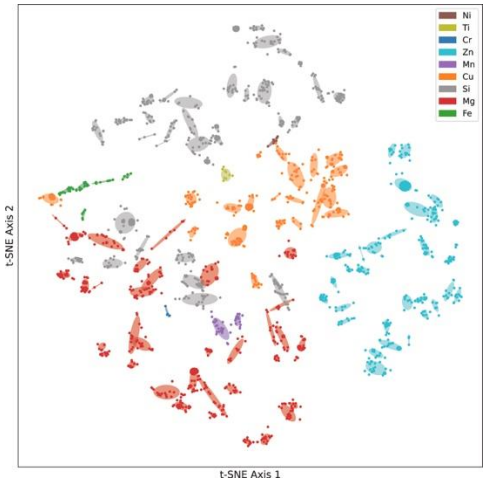






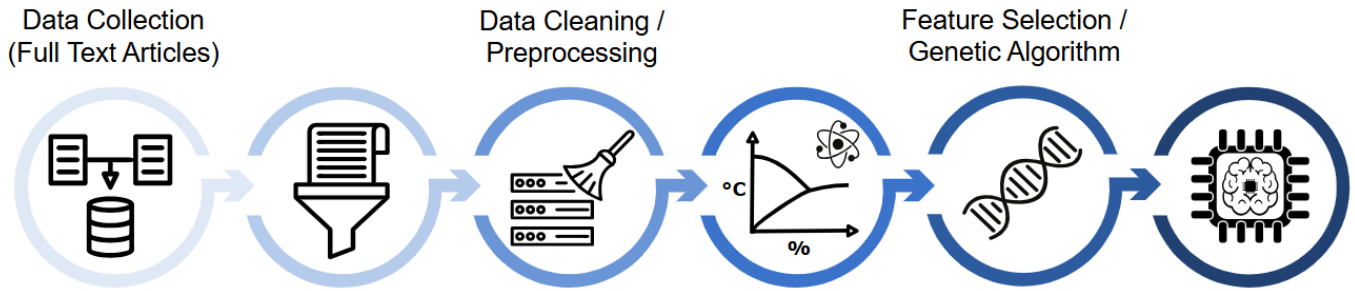
LIGHT METALS & EFFICIENT PROCESSES
DIGITALIZATION / PROMETTOOLS

- ProMet-Vision
- ProMet-Sense
- **ProMet-Deep**
- ProMet-2New



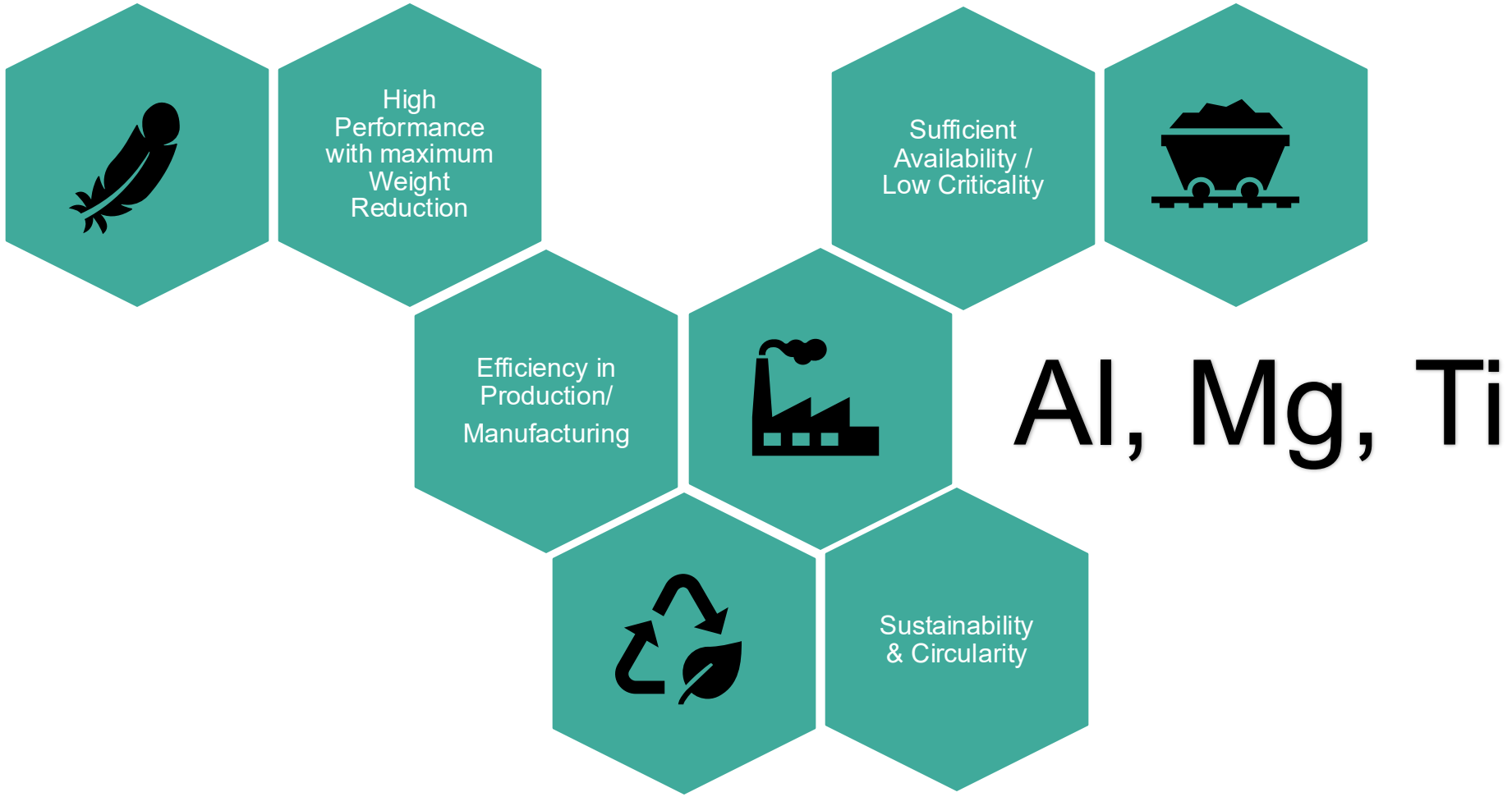
Predicting Mechanical Properties in Aluminum Alloys: A Data-driven Framework Leveraging LLM-Based Data Extraction and Physics-based Feature Engineering

L. Pichlmann, S. Rafiezadeh, M. Hofbauer, E.D. Ocansey, J.A. Österreicher



materialstoday COMMUNICATIONS

WHAT QUALIFIES MATERIALS AS 'ADVANCED'?



HOW DO WE APPROACH THE DEVELOPMENT OF ADVANCED MATERIALS?

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Combine

TAKE AWAY

Key Insights for Future Material Development

- Progress in material development emerges primarily where **multiple objectives converge** – combining efficiency, sustainability, robust industrial processes, and secure raw material availability.
- Efficiency, sustainability, and resource security must be considered together to ensure resilient and future-proof production systems.
- **Artificial Intelligence** enables optimization of manufacturing processes and accelerates material innovation, reducing development cycles and enhancing performance.
- **Material Acceleration platforms** represent a critical future trend, providing integrated environments for rapid experimentation, simulation, and data-driven decision-making.

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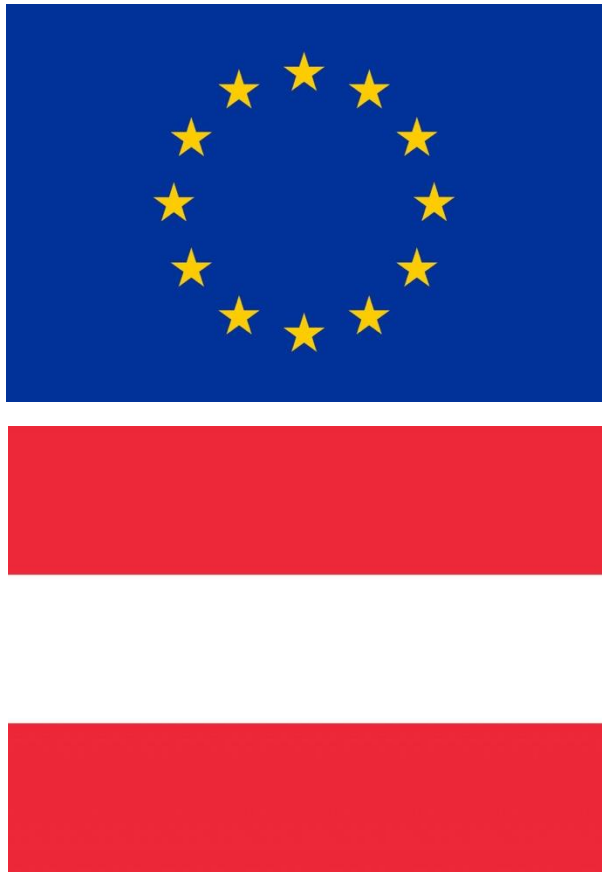
Acknowledgements



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THANK YOU!

Dr. Carina Schlögl, 14.11.2025