

# MATLEV

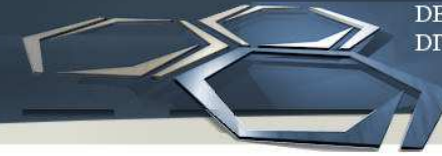
## New materials and technologies for lightweight generic components of electric low-emission concept vehicle

Prof. Malgorzata Lewandowska  
Warsaw University of Technology  
Faculty of Materials Science and Engineering

MATERIALS  
DESIGN  
DIVISION

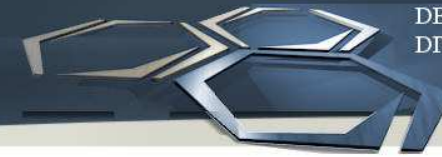
  
Narodowe Centrum  
Badań i Rozwoju





- Warsaw University of Technology (WUT),  
Faculty of Materials Science and Engineering,  
Materials Design Division, Poland (Coordinator)
- Technische Universität Dresden (TUD),  
Faculty of Mechanical Science and Engineering,  
Institute of Lightweight Engineering and Polymer  
Technology, Germany
- TAPS, Poland (industrial partner)





- Established in 1826
- 17 Faculties
- 31,800 students
- 2,540 academic staff

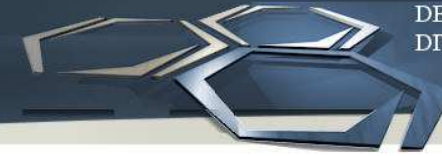
Offers 3 levels of studies:

- Bachelor of Science (B.Sc.)
- Master of Science (M.Sc.)
- Doctor of Philosophy (Ph.D.)



## University Faculties:

1. Architecture
2. Chemical and Process Engineering
3. Chemistry
4. Civil Engineering
5. Electrical Engineering
6. Electronics and Information Technology
7. Environmental Engineering
8. Geodesy and Cartography
9. Mathematics and Information Science
10. Physics
11. Power and Aeronautical Engineering
12. Transport
13. Automobiles and Heavy Machinery Engineering
14. **Materials Science and Engineering**
15. Mechatronics
16. Production Engineering
17. Civil Engineering, Mechanics and Petrochemistry



**1929** - Division of Metallurgy and Materials Science founded by **Prof. J. Czochralski**

**1991** – Faculty of Materials Science and Engineering established

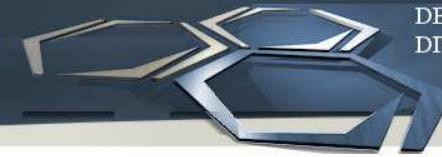
**Today - ranked No 1** in the Science Evaluation Exercise

## Faculty in numbers:

- ❑ 350 undergraduates
- ❑ **80 Ph.D. students**
- ❑ 34 academic staff
  - 16 professors
  - 18 assistant professors
- ❑ 17 Postdocs
- ❑ 26 technical and administrative staff

1. **Lightweight and Nanomaterials (NANO)**
2. **Biomaterials and bioengineering (BIO)**
3. **Functional and tailored materials (FUNCTION)**
4. **Materials for energy (ENERGY)**
5. **Surface engineering (SURFACE)**
6. **Degradation of engineering materials (DEGRADATION)**
7. **Modern methods of materials characterisation (CHARACTERISATION)**
8. **Multiscale modelling (MODELLING)**

# Dresden University of Technology



- **Established in 1828**
- **14 Faculties ( 5 Schools)**
- **36,534 students**
- **8.171 academic staff**

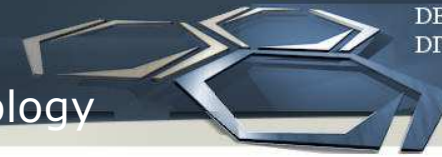
## Schools:

- School of Civil and Environmental Engineering
- School of Medicine
- School of Science
- School of Engineering Sciences
- School of Humanities and Social Sciences



## University Faculties:

1. Computer Science
2. Electrical and Computer Engineering
3. **Mechanical Science and Engineering**
4. Civil Engineering
5. Architecture
6. "Friedrich List" Faculty of Transport and Traffic Sciences
7. Forest, Geo and Hydro Sciences
8. Arts, Humanities and Social Science
9. Literature, Linguistics and Cultural Studies
10. Education
11. Law
12. Business and Economics
13. Science
  - Mathematics
  - Physics
  - Chemistry and Food Chemistry
  - Psychology
  - Biology
14. Medicine Carl Gustav Carus



## Key areas of research

### Multi-material, cross-sector solutions for the development of innovative lightweight products and flexible production processes

- Mechanical characterization of reinforced and non-reinforced materials
- Draft, design, structural analysis, simulation, optimization and cost-based analysis of lightweight structures made of isotropic, anisotropic and hybrid materials
- Procedural development and process analysis (focus: fibre- and textile-reinforced composites)
- Experimental validation and testing of prototypes (component and system level)
- Development of efficient production chains, analysis of product lifecycles



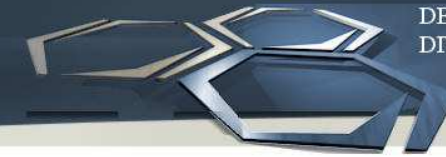
Photo credits: Airbus, Rolls-Royce, Siemens, KUKA, ALIEN-Projektteam



HIGHTECH  
MADE IN GERMANY  
CREATED IN SAXONY

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[www.taps.com.pl](http://www.taps.com.pl)

Company SZTK TAPS Maciej Kowalski Has been existing since 1989.

TAPS produces chairs for many types of mass transport and deliver them to companies such as :

ALSTOM, BOMBARDIER, EUROMAINT, NSB, STADLER, VAGONMASCH, NEWAG, PKP, PESA, WARSAW METRO.

TAPS Quality Management System meets requirements of ISO 9001, IRIS rev02, PN EN ISO/ IEC 17025, ISO 14001.

Current research project:

FOTEKO –

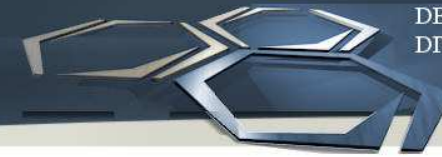
*Light and eco-friendly seat for public transport.*



UNIA EUROPEJSKA  
EUROPEJSKI FUNDUSZ  
ROZWOJU REGIONALNEGO



# Aim of the project



The main goal of the project is to design and offer new solutions in the field of vehicle architecture, based on innovative structural and functional materials.

The project focuses on the development of environment-friendly advanced materials and their production processes which will be utilised to produce selected generic components for a Lightweight Electric Low-emission concept Vehicle (LEV).

The major requirements for such components are:

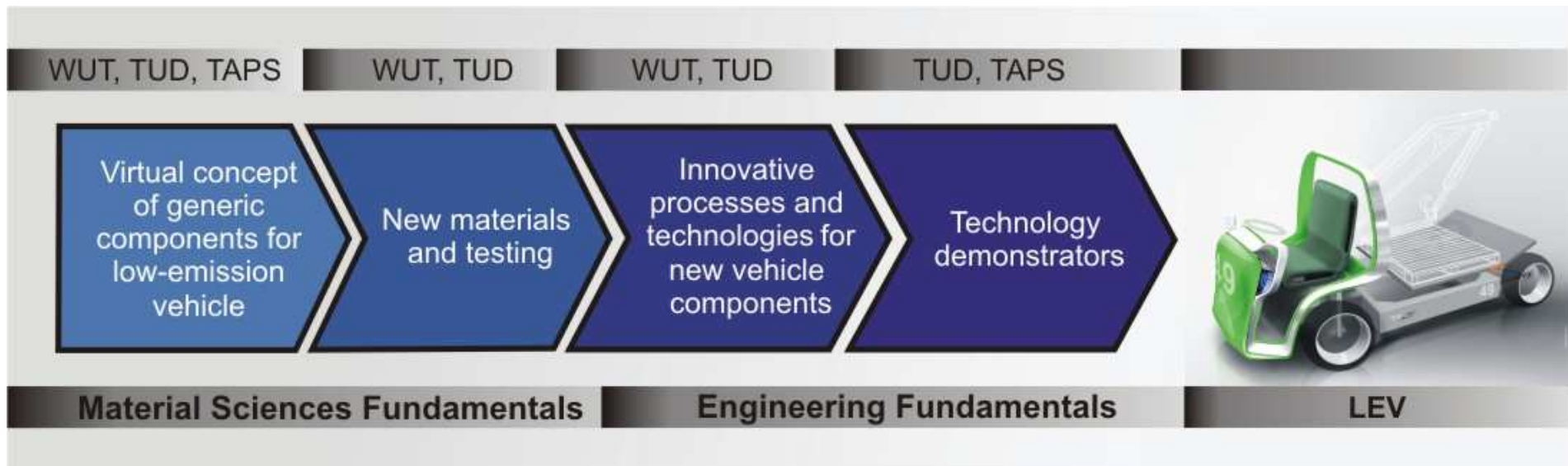
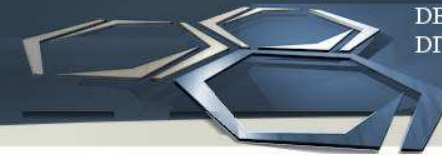
- lightweight,
- recyclability,
- eco-friendly initial substrates

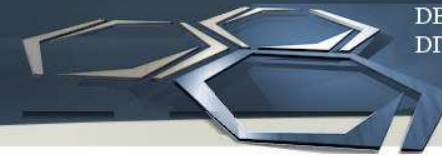




# Overall concept of the project

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# Workpackages

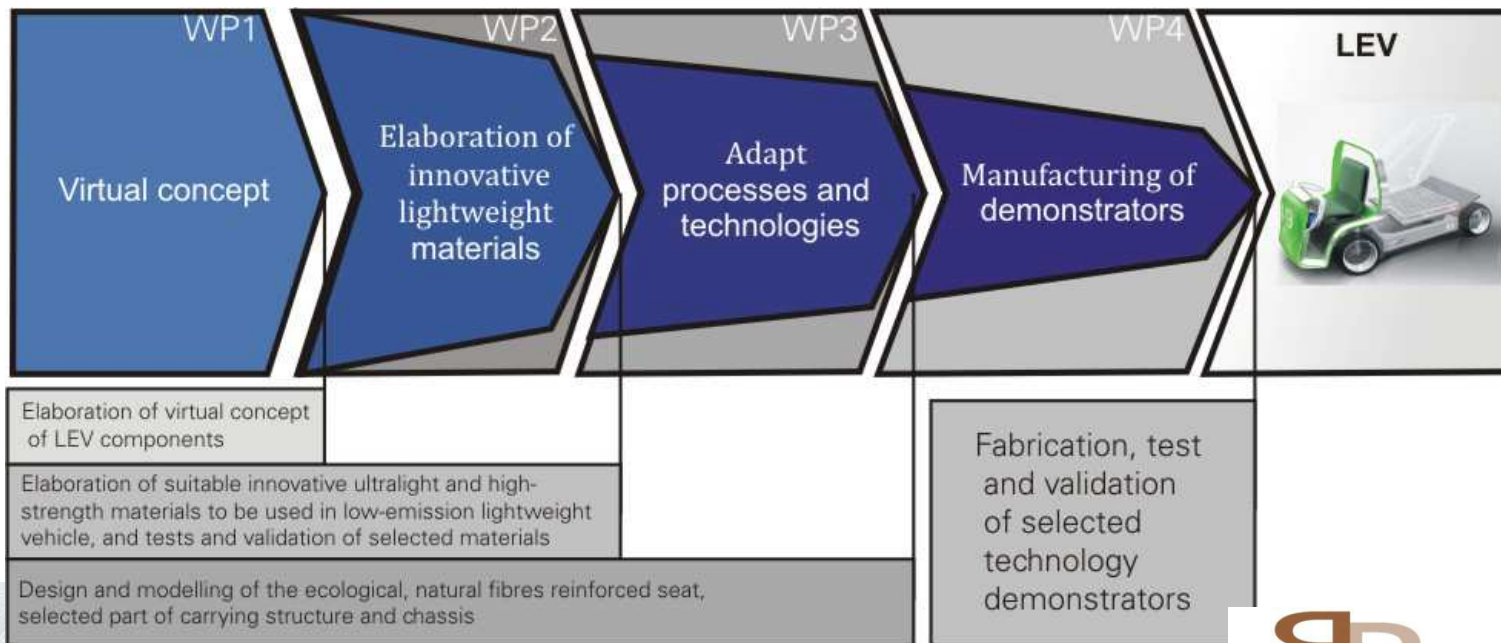
WP 1 - Virtual concept of generic components for low-emission vehicle

WP2 - New materials and testing

WP3 - Innovative processes and technologies for new vehicle components

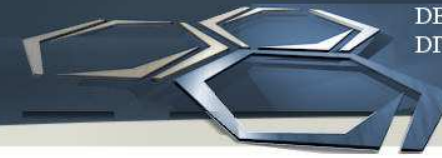
WP4 - Technology demonstrators

WP5 - Management



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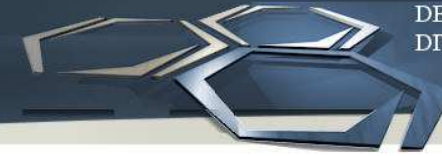




## Virtual concept of generic components for low-emission vehicle

- Requirements, Specifications and preliminary Studies – Materials - WUT
- Requirements, Specifications and preliminary Studies – Processes - TUD
- Development of Virtual Concepts TUD, TAPS
- Requirements, Specifications and preliminary Studies – generic samples and technology demonstrators TUD, TAPS
- Safety Concept - TAPS

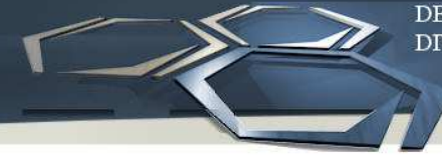




## New materials and testing

- Fabrication of ultrahigh strength wires and rods made of Ti and Al alloys – WUT
- Development and testing of novel flame retardant nano-composites – WUT
- Development and testing of natural fibre composites – TUD, WUT

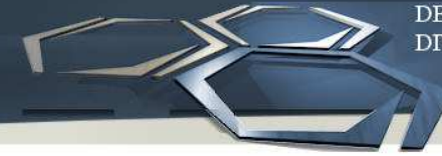




## Innovative processes and technologies for new vehicle components

- LFI technology for natural fibre composites – TUD, WUT
- Braiding technology – TUD, WUT
- Development of joining procedures of metal and composite parts - WUT



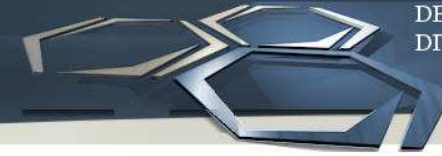


## Technology demonstrators

- Design and modelling of the component structures - TUD
- Design of the tools and moulds based on activities performed in previous WP's – TAPS, TUD
- Manufacture of the tools and moulds that are adjusted to the requirements specific technologies – TAPS
- Trial use of tools and moulds and validation of produced electro-vehicle components - TAPS, TUD
- Fabrication of demonstrators of electro-vehicle components e.g. frame, chasse, battery box, seats - TAPS, TUD



# Expect impact



The implementation of new solutions will improve economics and ergonomics of vehicle, and many of them could find application in other fields of industry. Recycling techniques will be developed in parallel with the production of new materials to take care of the environment.



# Thank you for attention

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