Institute of Advanced Materials and Processes

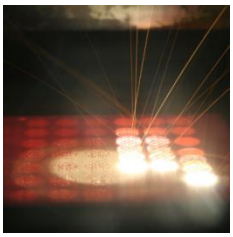
The research focus of the Institute of Advanced Materials and Processes (Zentralinstitut für Neue Materialien und Prozesstechnik, ZMP) at the University Erlangen-Nuremberg is on interdisciplinary topics being located in between **Material Sciences, Mechanical Engineering, Chemistry and Physics.** In a young and highly innovative environment, new material concepts and the corresponding production techniques including lightweight constructional components are developed. Main goal is the transfer and development of basic research ideas, which evolve from the institutes involved in ZMP, from the lab scale to the prototype stage.

The considered range of materials includes **light metals, high temperature alloys, ceramics and carbon.** Typical process routes include different additive manufacturing processes, rapid prototyping technologies or powder injection molding.

The institute is located at the technology campus Uferstadt Fürth since 2006 and has a total area of more than 3000 square meters of lab, office and technical space. ZMP offers a development platform for cooperation partners from industry and academia.

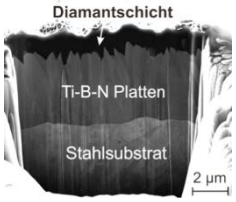
Electron Beam-based Additive Manufacturing

Starting from metal powder and CAD data, Selective Electron Beam Melting (SEBM) enables near-net-shape manufacturing of almost any geometry. Processing under vacuum atmosphere ensures high material purity and quality. Thus even high melting or reactive materials such as titanium, copper or nickel-base alloys can be handled.



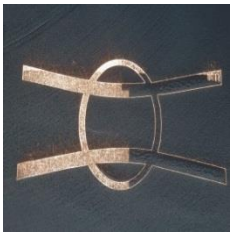
Diamond Coatings

The diamond coating group works on Hot-Filament Chemical Vapor Deposition of diamond thin films on metallic and ceramic substrates. Applying a recently developed high-temperature interlayer, the adherence of diamond coatings on steel substrates is improved. Additionally, the scale-up of the process towards higher growing rates and higher areas of deposition is addressed.



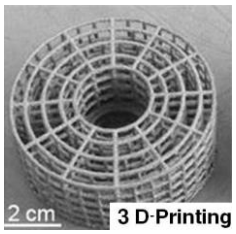
Laser-based Additive Manufacturing

The working group's focus is on research and development of laser-based generative manufacturing processes, e.g. Selective Laser Melting (SLM) of metals in the powder bed or laser-based powder deposition welding. Laser melting of metals in the powder bed is addressed in detail within the Collaborative Research Center 814 – Additive Manufacturing (supported by the German Research Foundation).



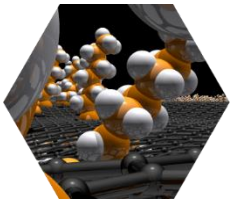
Rapid Prototyping of Ceramics

Rapid Prototyping is defined as the manufacturing of near-net-shaped components by a layer-wise approach. At ZMP highly complex ceramic structures are produced applying various Rapid Prototyping processes such as Laminated Object Manufacturing (LOM) with preceramic papers, Robocasting, Fused Deposition Modeling (FDM), Selective Laser Curing (SLC) or Three-Dimensional Printing (3D-Printing).



Functional Carbon Allotropes

The ubiquitous element carbon is the scientific base of the "Carbon Allotropes" research group. Next to the common carbon modifications graphite and diamond, the synthetic carbon allotropes – fullerenes, carbon nanotubes and graphene – are in the focus of current material research.

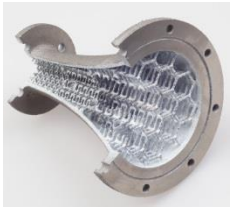


Materials Testing

The focus of the working group "Materials Testing" is on in-situ testing of various material systems. The Large-chamber Scanning Electron Microscope (LC-SEM) allows for mechanical materials testing and microstructural characterization at the same time. Additionally, non-destructive materials testing of large components is possible.

Technology Transfer Center VerTec

The Technology Transfer Center VerTec develops tailor-made components, e.g. for medical, energy or process engineering applications. The focus is on Additive Manufacturing of components using Selective Electron Beam Melting. A subsequent coating of the structure with catalytically active materials is possible.



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