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DIETMAR DRUMMER

Prof. Dr.-Ing. , The Institute of Polymer Technology (LKT)

As a part of the Mechanical Engineering Department of the University of Erlangen-Nuremberg conducts various research and teaching activities in the field of polymer design and processing. The main interest lies in the reciprocal influences of material and material behavior on part design and production processes as well as in the effect of these interactions on the short- and long-time behavior of polymer parts. Simulations of production processes and parts in service are used to get a better understanding of these correlations. New material and process models get enhanced by implementing advanced material parameters.

The institute which is led by Prof. Dr.-Ing. Dietmar Drummer employs approx. 20 research associates and another 20 staffs in the technical and administrative area. The employees can draw upon the chair's more than 20 years of experience while working on innovations in the field of plastics engineering.

The following main focuses and interdisciplinary issues can be deduced from the chairs divisions "Thermoplastic Processing", "Materials and Design" and "Plastics in Mechatronics".

Development of mechatronic systems (leak proof overmolding, film technology, 3D-MID)

Design of machine elements (gear wheels, slide bearings)

Polymer testing (thermal, mechanical, microscopic-optical, computed tomography, …)

Plastics-oriented part configuration and design

Lightweight design of polymers (engineering, process development)

Simulation of material behavior and processes

Highly filled polymers (polymer bonded magnets, thermal and electrical conductivity)

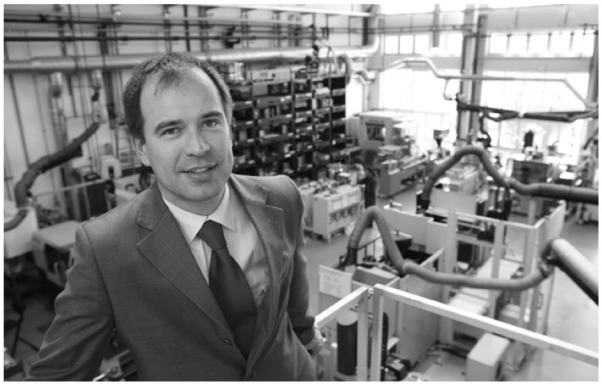
Joining technology (screws, welding)

Micro-technology (injection molding, extrusion)

Special technologies (multi-component injection molding, injection molding of thermosets and ceramics)

Failure analysis on plastic parts (expert reports, …)

The LKT often conducts application oriented cooperation to implement the results of its research and development work into industrial use. Collaborations can take place within government funded research projects, industrial orders as well as within industrial joint research projects (e.g. so called "Industriekreise"). Subventions for government funded projects can be applied for on a state-, federal- and European level, depending on the orientation of research.



Prof. Dr.-Ing. Dietmar Drummer in front of the technical center, one of the laboratories at the LKT.

To give an insight into the variety of research the LKT conducts some of the institute's fields of activity are shown exemplary hereafter.

POLYMERS IN MEDICAL APPLICATIONS

Thanks to the recent advancements in plastics, the workday life of physicians cannot be imagined without them anymore. These plastics are applied in implants, medical appliances or clothing.

The project "Additive Manufactured Individual Implants for Reconstructive Surgery" proved that it is possible to produce individual and bio-absorbable implants on a 3D-printer. The human body can decompose the material of the implants gradually and replaces it with bone material again.

Another example for plastics in medical applications is the use as a temporary binder to produce complex implants, including ceramic and metal components. The Institute of Polymer Technology uses a binder, based on different polymers for molding metal or ceramic powder. When using the injection molding machine to form the medical part, even more complex geometries, compared to standard processes, can be manufactured. With this free geometry design it is possible to get implants that, after debinding and sintering, match the patients' requirements exactly.

With powder injection molding it is possible to create multi-material-systems for medical appliances Contact: Dipl.-Ing. Susanne Messingschlager: messingschlager@lkt.uni-erlangen.de

POLYMERS IN MICROSYSTEMS TECHNOLOGY

Microsystems technologies are widely used in different technical applications like medical technology, electronics or as micro-electro-mechanical systems (MEMS). Their continuing miniaturization with simultaneously increasing functional density and usage requirements demands higher standards of their polymer micro parts.

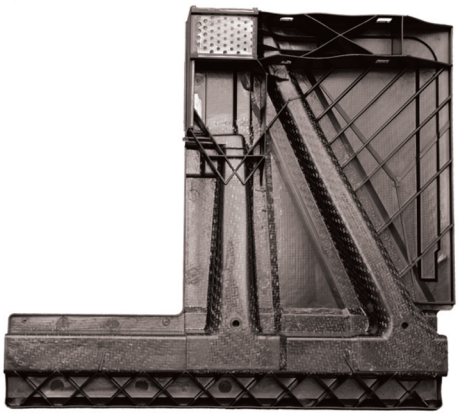
The quality of injection molded micro parts is notably influenced by the interactions of material, production process and the resulting part properties. The research group 702 explores novel process strategies to improve the part quality. The research is focused on crystallization behavior as well as mechanical properties. Furthermore, aspects concerning the producibility of particularly thin-walled or microstructured parts are systematically investigated. Mold design and novel process strategies like a specific temperature control in the mold or expansion injection molding have positive effects on the resulting part properties.

The micro-gripper of research group 702 has smallest functional components produced via the liquid phase of a variety of materials. Contact: Dipl.-Wirtsch.-Ing. Steve Meister: meister@lkt.uni-erlangen.de

POLYMERS IN LIGHTWEIGHT APPLICATIONS

Plastics are predestinated for applications in lightweight component parts due to their low density. In combination with fibers one can achieve fiber-reinforced plastics whose weight-related mechanical properties can be much higher compared to the pure polymer matrix.

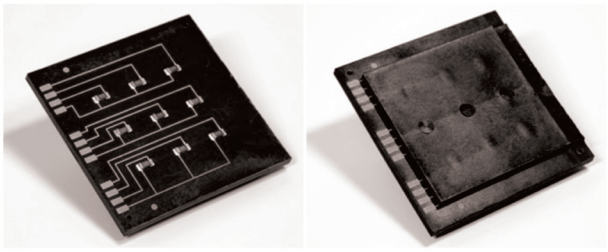
Besides the fundamental investigation of thermoplastic based fiber reinforced plastics as well as their short and long-term behavior the Institute of Polymer Technology develops technologies to process fiber reinforced thermoplastics and brings them to a level of pilot series. Thereby also established technologies are combined in a new way considering constructional and procedural aspects. Thus, conventional constructions can be substituted by lightweight structures with high functional integration.



High-duty integral constructions like this rear seatback consisting of fiber reinforced plastics can be manufactured economically by integrative processing technologies. Contact: Dr.-Ing. Thomas Müller: mueller@lkt.uni-erlangen.de

POLYMERS IN MECHATRONICAL APPLICATIONS

Nowadays the most important technical trends go along with innovations in the field of material and especially polymer science. Thereby mechatronic systems offer a great area for polymer applications because of the special properties of plastics. Additionally, their thermal, electric and magnetic characteristics could be expanded in a wide range by using special fillers. For example thermal conductive polymers could be applied for cooling high power electrical components or magnetic plastic parts help downsizing rotary encoders and enable a smart process for mass production of these.



Overmoulding of circuit boards with thermoplastic polymers provides a good reliable shelter of electrical components from mechanical stress and aggressive media – in addition the integration of further functional elements like snap-fits is possible. Contact: Martina Vetter, M.Sc.: vetterm@lkt.uni-erlangen.de

Development of processes like assembly molding has high priority here. This way of manufacturing enables to combine different components and materials in a time- and cost-efficient process and makes the integration of further functions like a media tight thermal conductive housing with electrical isolation and mechanical shelter possible.

PLASTICS IN EDUCATION AND PROFESSIONAL TRAINING

Especially the powerful interdependency of material, design and process during the development of plastics parts makes it necessary to connect practical skills and theoretical knowledge across different industrial sectors and countries. The Institute of Polymer Technology is concerned in several scientific corporations with industrial partners and institutes for spreading specific material knowledge in a wide range of subjects and applications. In this context an information platform (www.plasticsonline.info) will be created with the aim to incorporate the knowledge about plastics and plastic processing fast and sustainable.

Furthermore the integration of the Institute of Polymer Technology into the Faculty of Engineering at the University of Erlangen-Nuremberg provides for over 500 students each year a continuous education in polymer technology. Offering a huge variety of different practical and theoretical classes in the field of polymer science and technology guarantees the highest quality of academic qualification worldwide. Partnerships with companies, research institutions as well as international educational institutes are well established and intensify the student interests in polymeric materials.

Classes, conferences and seminars coordinated by the LKT take place at regular intervals Contact: Dipl.-Wirtsch.-Ing. Florian Ranft: ranft@lkt.uni-erlangen.de

More information about our current lectures and professional trainings are available at http://www.lkt.techfak.uni-erlangen.org.