Polymer optics can be used for several new applications, for example in combination with LED technology. With the use of freeform surfaces, various new illumination systems can be created. Microstructures that are replicated in polymer parts also enable significant progress in medical technology and biotechnology: The cost-efficient replication of microfluidic devices makes new analytical processes possible for diagnostics; for example, specially designed and replicated microstructures can be used for growing skin cells.

Benefits of polymer parts

- Broad scope for geometry of part
- Low costs for serial production
- Production of cheap disposables

Our services

- Ultra-precise replication of polymer parts by injection molding, injection compression molding and hot embossing
- Use of manufacturing technologies such as overmolding and back injection molding of films for new applications
- Support during the design for manufacture of polymer parts
- Development and manufacture of molds and mold inserts for polymer optics and microstructured polymer parts
- Process optimization aiming for high form accuracies and short cycle times
- Iterative compensation for shrinkage of polymer parts in order to reach form accuracies of only a few micrometers for thick-walled polymer parts
- Small batch production of polymer optics and microstructured polymer parts

Our skills

- Consideration of the whole process chain for the replication of polymer optics (optical design, mold design and manufacture, replication, metrology)
- Holistic matching of the individual process steps to minimize interface problems
- Possibility of the ideally matched optimization of the replication process and the mold inserts for complex geometries such as microfluidic devices
- Extensive knowledge and equipment for optics mold-making (manufacture of freeform surfaces, diamond machining, micro-milling)
Mold technology

- We match the mold technology with the desired component and thereby guarantee a replication of the part with highest form accuracies.
- Different options offered by the injection compression molding process can yield higher form accuracies and better properties of the parts depending on the geometry of the part.
- We develop molds and mold inserts with a special focus on the individual application.

Process development and small batch series production

- We develop suitable processes for the replication of various optical and microstructured polymer parts.
- The Fraunhofer IPT uses its own master molds with adapted mold inserts for the cost-efficient production of prototypes and small batch series.
- We consider the whole process chain and use this approach as optimal condition for feasibility studies.

Process optimization

- Our focus is the cost-efficient production of high-quality parts.
- There is high potential for optimization with respect to shorter cycle times, especially for thick-walled polymer parts. We achieve shorter cycle times by ensuring high process stability and by compensating for shrinkage by modifying the mold inserts.
- We are well equipped with metrology and software for metrology data feedback that is used for systematic optimization of the mold inserts and shrinkage compensation.

Our equipment

- Ferromatik Milacron Elektra Evolution injection molding machine with clamping force of 155 t and injection compression molding functionality.
- Arburg Allrounder S injection molding machine with clamping force of 25 t and injection compression molding functionality.
- Jenoptik Hex 02 hot embossing machine.
- Master molds for the replication of polymer optics and microstructured polymer parts with different dimensions.