

## Motivation

In the micro replication like micro injection molding LIGA mold inserts are used. LIGA parts have several applications in different fields of industry like micro mechanics, microfluidics, medicine and biotechnology. For a reliable and cost efficient manufacturing of LIGA mold inserts new mold concepts for injection molding need to be developed. Aspects covered including mold insert fabrication, tool concept and handling system for micro injection molding.

## The LIGA Process

The LIGA process (Lithographie, Galvanoformung, Abformung) invented in the 1980's has developed to a key production technology in the microsystem technology.

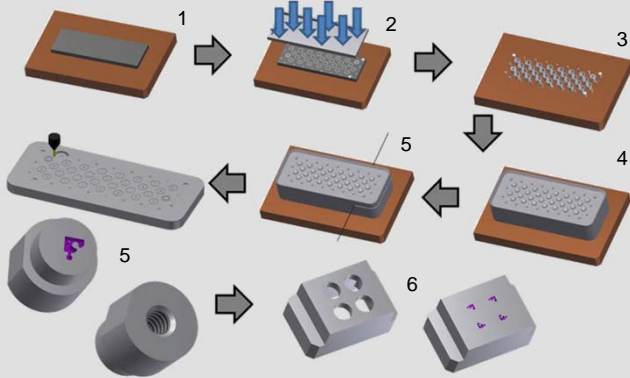


Figure 1: The LIGA process chain

Figure 1 shows the following main steps of the LIGA process:

1. Preparing the substrate and resist
2. X-ray lithography
3. Development
4. Electrodepositon
5. Mechanical postprocessing
6. Installing the mold inserts in a holder plate

## Mold inserts

The mechanical post-processing of the LIGA mold Inserts is shown in Figure 2.



Figure 2: 1) structured nickel, 2) dimensions of the mold inserts, 3) LIGA mold inserts, 4) SEM figure of a LIGA cavity

## Tool Concept

The tool concept for the microsystem 50 injection molding machine is based on a pulling step.

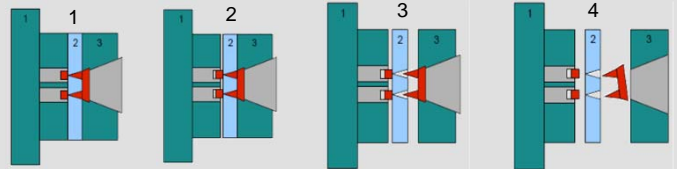


Figure 3: Process sequence of the mold concept

Figure 3 shows the following main steps of the tool concept:

1. Complete filling of the cavities with closed mold
2. Opening movement of the ejector side (200 µm)
3. Separation of the parts with a pulling step
4. Ejection of the gate system

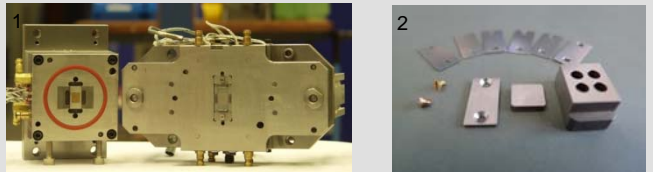


Figure 4: 1) mold for the microsystem 50 injection molding machine 2) mold insert holder plate

## Handling

The existing handling modul of the microsystem 50 machine is supplemented with an underpressure modul. This model can collect parts in the µm range.

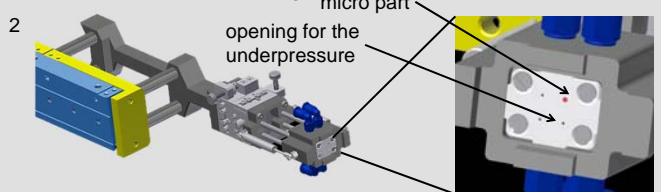


Figure 5: 1) microsystem 50, 2) handling system

## Conclusions

A complete LIGA process sequence can be shown with a new mold insert design, mold concept and handling system.

## Acknowledgements

We gratefully acknowledge the participating companies Arburg GmbH+Co KG, Otto Männer GmbH and RKT Roderger Kunststoff-Technik GmbH. This work was carried out with the support of the Karlsruhe Nano Micro Facility (KNMF, www.kit.edu/knmf), a Helmholtz Research Infrastructure at Karlsruhe Institute of Technology (KIT, www.kit.edu).