

UV-LIGA Mold Inserts to Replicate Single Polymeric Microparts and Produce Metallic Microparts through the MSG Process

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Abstract

There are several manufacturing technologies to fabricate mold inserts for micro injection molding like μ -EDM, μ -milling, laser sintering, laser ablation, silicon technologies etc. [1]. But the one process that has unique properties is the LIGA-process. In this process really smooth surface roughness ($R_a < 30$ nm) can be produced, whereas the process gives nearly lateral design freedom, and aspect ratios up to 10 with a high reproducibility.

This presented work uses mold inserts fabricated by the UV-LIGA process [2] to produce single polymeric microparts (Fig.1 a) in a novel way. The new concept enables the production of high aspect ratio single polymeric microparts without using any ejector pins during the demolding process. Further more are the microparts separated from the sprue after injection molding.

In addition a general new process is presented that is used to replicate LIGA structures by a combination of multi-component injection molding and electroforming (MSG Process Fig. 1 c) [3].

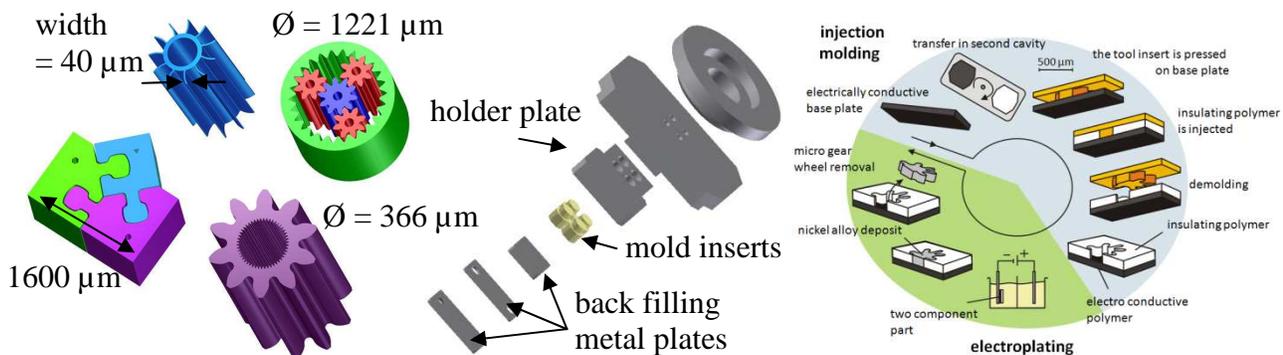


Figure 1: a) examples for polymeric microparts, b) tooling concept for LIGA-mold inserts for the Micro System 50 micro injection molding machine c) Process sequence of the MSG process

The process is based on the highly accurate reproduction of surface details through injection molding to build a microstructure into a two-component template and electro deposition of e.g. nickel into this cavity. This electroplated micropart is the replication of the former structure.

[1] Hans Nørsgaard Hansen et. al. "Tooling Process chains and Concepts" Elsevier, 2010, 287-297

[2] Prokop, J.; Heneka, J.; Lorenz, J.; Moehwald, K.; Piotter, V.; Ritzhaupt-Kleissl, H.J.; Vetter, K.; Hausselt, J.: How mold inserts influence the replication of metallic microparts produced by electroplating into two-component templates. *Microsystem Technologies*, 16(2010) S.1413-18 DOI:10.1007/s00542-010-1048-2

[3] Piotter, V.; Prokop, J.; Ritzhaupt-Kleissl, H.J.; Ruh, A.; Haußelt, J.: Multi-component microinjection moulding - trends and developments. *International Journal of Advanced Manufacturing Technology*, 47(2010) S.63-71 DOI:10.1007/s00170-009-1985-z