Multi-Component Micro Injection Moulding
– Trends and Developments


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Macroscopic Industrial Applications

- 5-component injection moulding
  Arburg GmbH & Co. KG

- 2-component metal injection moulding
  AMT Ltd., Singapore

- Multi-component injection moulding
  with moveable connections
  Geobra Brandstätter GmbH & Co. KG
Multi-Component Injection Moulding

Advantages and Disadvantages

Realization of **immovable** connections, usually material compounds
Realization of **movable** connections, sometimes not mountable joints
Functions integration by combining different materials
Saving of additional **mounting steps**
Reduction of handling-, alignment- and assembly expenditure
Reduction of **plant costs**

Longer **cycle times**
More complex tooling and process conduct
2C-Micro Injection Moulding – immovable linkage of polymers

2-Component Battenfeld Microsystem 50

- TPE
- ABS

Housings for hearing aids
1. Injection of housing, ABS
2. Injection of sealing, TPE

Source: Battenfeld Injection Moulding Machines, Austria
2C-Micro Injection Moulding – movable linkage of polymers

Micro Assembly Moulding
IKV, RWTH Aachen

joint head = POM

glenoid cavity = PMMA
2C-Micro Powder Injection Moulding – immovable linkage of metals or ceramics

Tasks:

Merge two different kind of metals/ceramics in green state

keep them connected even during sintering

→ compatible binder systems
→ adjustment of sintering shrinkage
→ adjustment of sintering temperature
2C-MicroPIM
Machine set-up Ferromatik K50 S2F

Realized first time:

- Variothermal Temperization
- Tool Evacuation

1. Injection unit, axial
2. Injection unit, L-position
2C-MicroPIM

Material: $\text{Al}_2\text{O}_3$/TiN-mixture ceramic, electr. conductivity depending on TiN-content
Demonstrator: ceramic heating needle
2C-MicroPIM

Adjustment of sintering shrinkage by variation of powder content

Green body length = 22 mm
cross section = 1 mm²

Function test run of ceramic heating element
2C-Micro Powder Injection Moulding – movable linkage of metals or ceramics

Tasks:

Merge different or alike kind of metals/ceramics in green state, separate themselves during sintering

→ preferably incompatible binder systems
→ different sintering shrinkage
→ different sintering temperature

Currently under development for micro applications

tolerance of bearing at side approx. 0,1 mm
Metallic Micro Parts Made by Electroplating on Two-Component Injection Moulded Templates

Manufacturing process for micro parts ...

... made of metal and ceramic materials
... with high surface qualities
... with finest structuring possibilities

www.forschergruppe-mikro.de
injection moulding of a conductive template

electroplating or electrophoresis

Basic Idea ...

1 component template out of PA12-C
Solution: 2C- Polymer Forms ...

- 2C-injection moulding
- electroplating / electrophoresis
- removal of product

Diameter approx. 550 µm
Outlook

Realization of immovable joints of different materials in micro dimensions
→ „Micro Assembly Injection Moulding“

Realization of movable joints in micro dimensions
→ „Micro Assembly Injection Moulding“

Automatic 2C injection moulding of microstructured templates

Optimization of polymer pairings

Realization of ceramic (electrophoresis) deposition
Thank you !