

PowderMEMS Technology

3D Microcomponents for Innovative Microsystems

MEMS energy harvesters with integrated micromagnets

Fraunhofer ISIT Powder MEMS unique advantages and possibilities to design your solutions

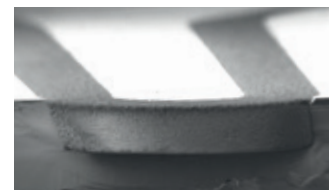
- 3D structures up to several hundreds of μm in thickness on wafer/ substrate-level
- Precise structural dimensions in between 20 and 4000 μm
- Numerous degrees of freedom, like magnetic, thermal and conductive properties, porosity and 3D-geometry
- Novel base technology for sensors, actuators, coils, transformers, cooling, filters etc.
- Advantages compared to other manufacturing techniques: low process temperatures, thermally and chemically resistant structures, BEOL-compatible pre- and post-processing, wide choice of materials

PowderMEMS Technology

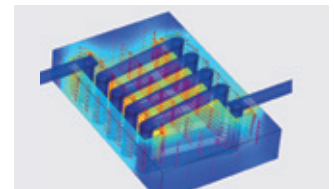
Fraunhofer ISIT has developed a patented process to create three-dimensional microstructures from a multitude of materials on wafer-level. The technology enables the integration of micromagnets, thermal insulation, microfluidic channels and numerous other features for next-generation microsystems. PowderMEMS access the third dimension on wafer-level for the design of microsystems with decisive advantages compared to other techniques like sintering or polymeric binding. Various parameters can be taken advantage of, such as the choice of powder material, the creation of three-dimensional shapes and the ability to pre- and post-process with established clean room techniques.

Examples of Applications

- Magnetic MEMS, e.g. energy harvesting and position detection
- Microfluidics, e.g. microreactors and catalysis
- Microelectronics, e.g. integrated microcoils for DC/DC converters



Cross section of a porous microfluidic structure



Microcoil with integrated soft magnetic core

Contact us to explore the advantages of our technology in your application

Fraunhofer Institute for Silicon Technology ISIT

Business Unit MEMS Applications – Agglomerated Microsystems
 Fraunhoferstrasse 1
 25524 Itzehoe, Germany
 Dr.-Ing. Björn Gojdka
 +49 4821 17-1412
 bjoern.gojdka@isit.fraunhofer.de
 www.isit.fraunhofer.de/powderMEMS

ISIT is participant of



Technical Specifications

Structure lateral dimensions	20 μm to 4000 μm
Structure thickness	40 μm to 600 μm
Applicable materials	as required: metals, ceramics, composites
Hard and soft magnetic properties e.g. NdFeB, SmCo, Fe	example NdFeB: $B_r \approx 400 \text{ mT}$, $H_c \approx 900 \text{ mT}$
Process temperature	75°C to 300 °C
Clean room compatible post-processing	yes
Porous structures / microfluidics	yes