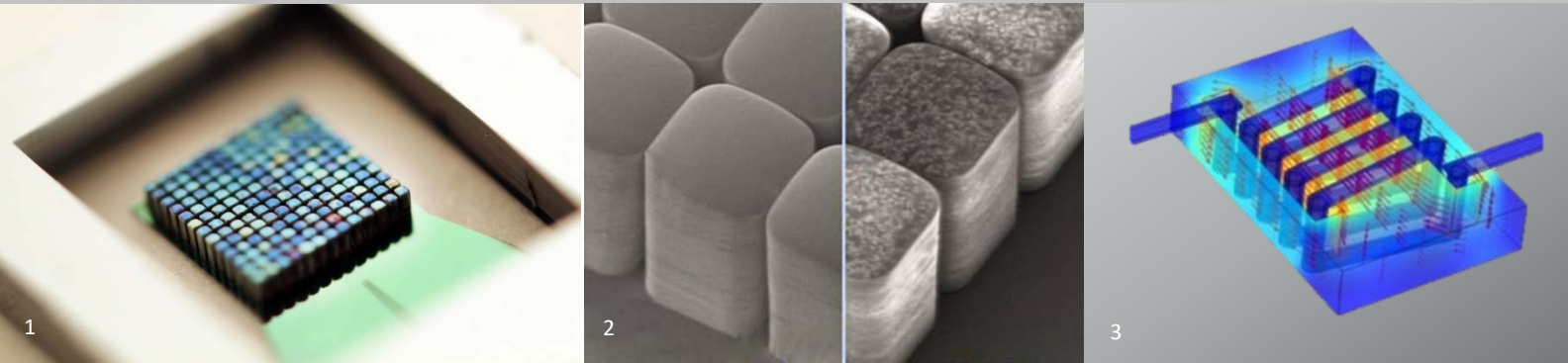


### FRAUNHOFER INSTITUTE FOR SILICON TECHNOLOGY ISIT



- 1 MEMS Energy harvester with integrated micromagnets
- 2 Magnetic PowderMEMS microstructures
- 3 Microcoil with integrated soft magnetic core

## PowderMEMS TECHNOLOGY

### 3D MICROCOMPONENTS FOR INNOVATIVE MICROSYSTEMS

Fraunhofer ISIT PowderMEMS unique advantages and possibilities to design your solutions

- 3D structures up to 500  $\mu\text{m}$  thickness on wafer-level
- Precise structural dimensions in between 20 and 4000  $\mu\text{m}$
- 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

#### 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.

#### Technical specifications

Structure lateral dimensions	20 $\mu\text{m}$ to 4000 $\mu\text{m}$
Structure thickness	40 $\mu\text{m}$ to 500 $\mu\text{m}$
Applicable materials	as required: metals, ceramics, composites
Hard and soft magnetic properties e.g. NdFeB, SmCo, Fe	example NdFeB: $B_R \approx 600\text{mT}$ , $H_c \approx 900\text{mT}$
Process temperature	75°C to 300 °C
Clean room compatible post-processing	yes
Porous structures / microfluidics	yes

#### Examples of application

- MEMS sensors, e.g. gas and mass flow
- MEMS actuators, e.g. magnetic drives
- Microelectronics, e.g. coils and transformers
- Microfluidics, e.g. porous filters
- Micropositioning

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