



- 1 Open cell structure in a particulate oxidation converter
- 2 Open cell structures with various cell sizes
- 3 SEM image of an open cell stainless steel foam

OPEN CELL METAL FOAMS

Open cell foams are permeable materials with metallic properties. They feature a very homogeneous structure which guarantees constant characteristics over a wide range. Open-cell metal foams can be produced in a large spectrum of pore sizes and densities. The adjustable pore sizes range from 0.3 to 5 mm, the relative density can vary between 5 and 30 %. Because of the structure's high variability, the functional properties like mechanical strength, sound absorption, fluid and heat transfer can be precisely adjusted. With this, functional materials with an enormous application range arise.

Applications

- **Catalytic converter substrates**
Open cell metal foams show good permeability, high specific surfaces and high strength. In particular high cross flow ratios enable the manufacturing of catalytic converters with high efficiency.

- **Biomaterials**

Open cell metal foams enable the ingrowth of bone cells due to the bioanalogous structure. Cellular titanium materials are helpful for implant fixation and bone replacement.

- **Heat insulation**

Cellular metals feature low heat conductivities. High temperature resistant materials can be used to create lightweight heat insulation components with high material efficiency for harsh environments.

- **Noise absorption**

Excellent acoustic absorption properties in combination with high temperature resistant metals allow the application in abrasive and hot surroundings.

Properties of the Structure

Cell size	0.4 – 5.0 mm
Porosity (adjustable)	75 – 96 %
Heat conductivity	approx. 1 – 5 % of basic material

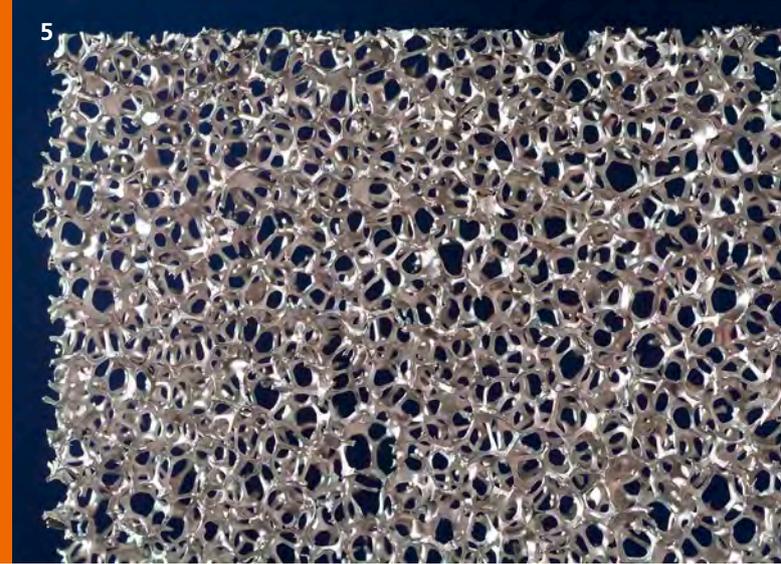
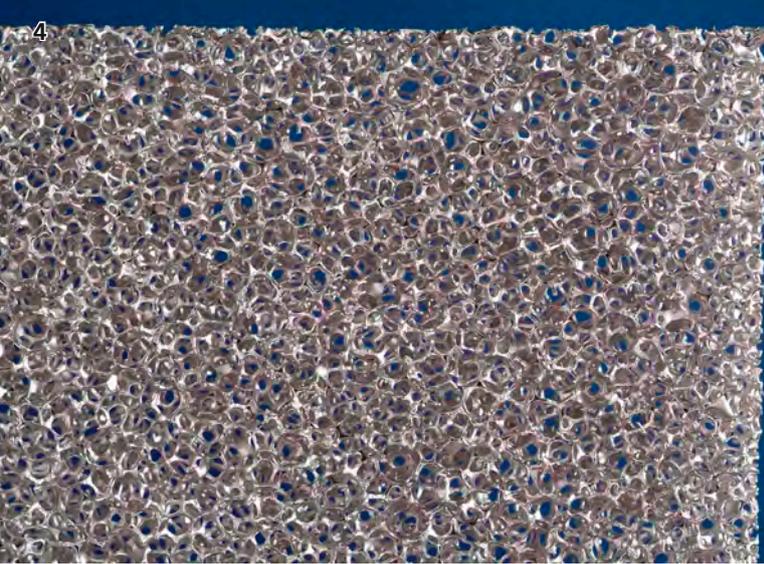
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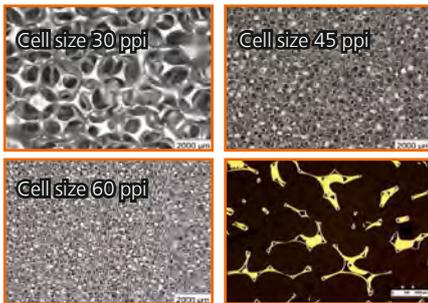
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cell size	pore diameter [mm]	spec. surface [m ² /m ³]
10 ppi	4.5 - 5.0	400
20 ppi	2.0 - 3.5	1100
30 ppi	1.8 - 2.0	1800
45 ppi	1.1 - 1.3	2800
60 ppi	0.7 - 0.8	3900
80 ppi	0.4 - 0.5	5300

Structure



Manufacturing by Replication Technique

Open cell metal foams are manufactured in a powder metallurgical replication technique. The method allows the processing of almost all materials which are available in powder form.

Stainless steels

Unalloyed steels, low alloyed steels, high alloyed steels, high temperature steels for application in machine building and vehicle construction

Titanium, titanium alloys, tantalum

Biocompatible materials for medical applications

Molybdenum

Materials for high temperature applications (e.g. heat exchanger devices)

Copper, copper alloys

Materials for applications with high heat conductivities

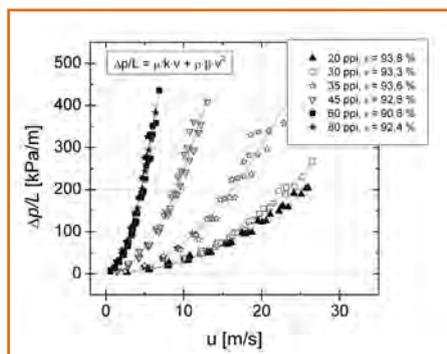
Gold and silver alloys

Materials for jewellery

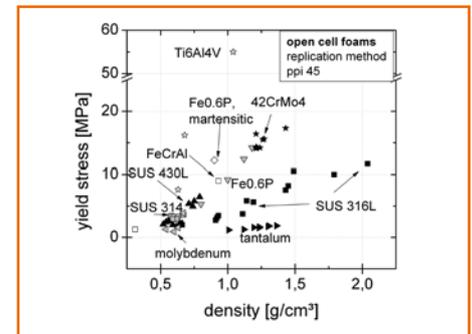
Pros Due to Metallic Properties

- Almost all metal powders are suitable
- Homogeneous cell size, min. 0.2 mm
- Ductility, strength and corrosion properties
- Damage tolerance
- Thermal and electrical conductivity
- Net shape technique
- Process is suitable for mass production
- Simple joining technique

Permeability



Mechanical Properties



R&D Services

- Application oriented studies of issues related to materials and manufacturing
- Market oriented feasibility studies
- Development of open cell metal foams on the basis of customer-specific materials
- Materials evaluation with respect to strength, energy absorption, corrosion resistance, and service at higher temperatures
- Component development
- Prototype and small series production
- Materials and component testing