



1 *Samples of porous metal papers*

POROUS METAL PAPER – TECHNOLOGY, PROPERTIES AND APPLICATIONS

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The Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM in Dresden in cooperation with the Papier-technische Stiftung PTS has developed the so-called Porous Metal Paper, an innovative route for the manufacturing of highly porous thin foils and sheets.

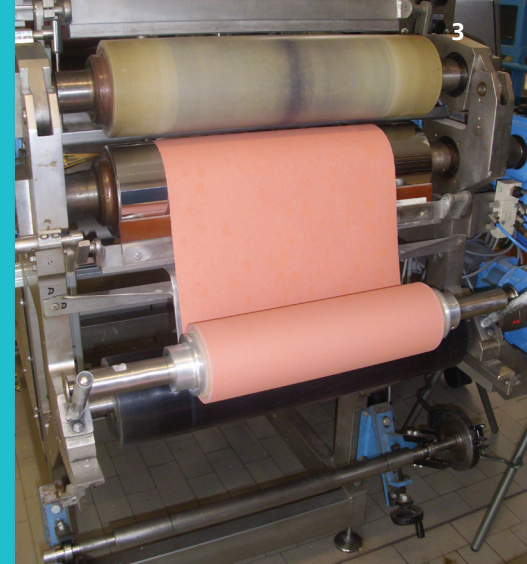
Its advantages are:

- Well established basic process
- Flexible selection of basic materials
- Adjustable pore size and porosity
- Simple shaping
- High reproducibility
- Suitable for mass production
- Low processing costs

Manufacturing

The new Porous Metal Paper results from the combination of paper processing and powder metallurgical sintering technologies.

Basically, in the paper manufacture metal powders replace the commonly used paper filler materials like caoline or spat, and the porous structure is generated by cellulose fibers. The resulting material is formable like standard paper, including folding, winding, corrugation or creeping. Even tube-like geometries can be manufactured in a wide range. In the final step the components undergo a heat treatment in which the organic constituents and the cellulose fibers are removed and the metal is sintered to attain the final shape.



Material Systems

The process can be adapted to various metals and alloys like

- Low alloyed steels and stainless steels
- Copper based alloys
- Nickel and nickel based super alloys
- Titanium and titanium alloys
- Refractory metals like molybdenum and tungsten
- Combination of metals and alloys
- Combination of metals and ceramics

Properties

The paper manufacturing process allows for the adjustment of a wide range of properties:

The thickness of the porous sheet can be varied between 0.1 and 1.5 mm, the maximum width can reach up to 400 mm in the lab scale stage. The porosity can be tailored in the range of about 30 to 75 %, and the pore size ranges from 10 to 300 μm . By additional inline coating during paper manufacturing a graded porosity can be fabricated. The Porous Metal Paper is characterised by an excellent mechanical stability.

Furthermore, filtration tests have shown the excellent filtration capability and efficiency up to temperatures of about 800 $^{\circ}\text{C}$. The filtration rate can be adapted and tailored by the pore size and pore morphology.

Potential Applications

Due to the feasibility of various base materials, the flexible property adjustment and the comparatively simple shaping technologies, Porous Metal Paper can be implemented in manifold applications:

- filters and membranes
- electrodes
- surface burners
- vaporizers and evaporators
- electromagnetic shielding
- heat exchangers and heat pipes
- thermal insulation
- catalytic converter and converter substrates

R&D Services

Fraunhofer IFAM Dresden offers application-oriented development, starting from basic material development up to the planning of a commercial production. Therefore, porous metal sheets with tailored geometries and properties, components and prototypes can be designed and manufactured. Our services range from the first material development up to the manufacturing of small series and the support of know-how transfer. Furthermore, we offer the testing of mechanical, physical and chemical properties.

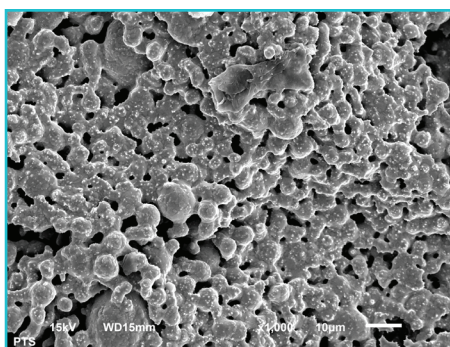


Fig. 1 SEM image of the surface of a porous metal paper

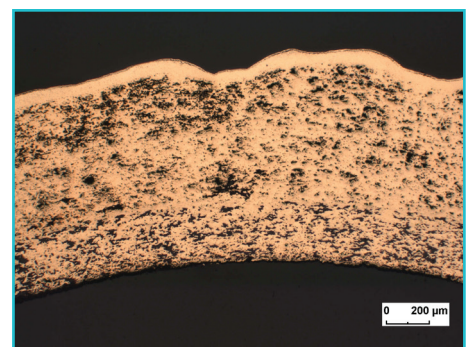


Fig. 2 Micrograph of a coated porous metal paper structure

- 2 Sample of porous metal paper
- 3 Porous metal paper being produced