Press information

Innovative nickel and iron-based alloy metal foam

Finished to give resistance and flexibility

As a substrate for industrial filters, catalysts, muffler silencers, or heat exchangers, as bipolar plates in fuel cells, flame distributors or spark separators, Alantum Europe GmbH's open-pore, freely ductile and electrically conductive alloy metal foam will impress in every application with its tailored properties. The nickel and iron-based metal foam is given these properties in a patented production process through the optimised, high-alloy metal powder.

The lightweight material from Alantum can thank its versatility, in part, to the iron or nickel-based metal foam from which it is produce with its open pore structure with a hollow web. The size of the pores is defined exactly at 450, 580, 800 and 1200 µm, just like its permeability. After the nickel or iron layer is separated by electrolysis, the Polyurethane foam is expelled through heat treatment and the metal foam is annealed until soft. The metal foam mats remain flexible and ductile thanks to the annealing process.

Optimised for the particular application thanks to the alloy powder

The stable coating process, patented by Alantum, with high-alloy metal powders brings the second part. This is where optimised alloys are used that react with the base material in the sintering process to give the alloy metal foam its homogenous structure and properties for the specific application. For example, corrosion resistance and ability to withstand high temperatures up to 1000 °C , with peaks of up to 1200 °C. At the same time, the specific surface is significantly enlarged. After subsequent pre-oxidation in a specially developed process, the material is not only very resistant to oxidation but is also mechanically stable and electrically conductive. The alloy metal foam also has a very good buffering capacity and high thermal conductivity at low thermal capacity. Decorative or functional coatings, so-called washcoats, can be applied and even restricted to specific zones or layers.

A real all-rounder for industrial filters, exhaust aftertreatment, sound insulation, and much more

The possibility of coating the alloy metal foam in material thicknesses of 0.695, 0.581, 0.448 and 0.351 g/cm^3 with different catalysts makes it an ideal material for applications in industrial filter systems. This is how filters are made for use, for example, in wet-painting booths, where they convert carbon hydrides contained in the waste gases into uncritical components though a tailored catalytic coating. The alloy metal is also suitable as a supporting cage for hose filters, for example. Here, it offers the advantage that the filter material lies flat, reducing mechanical stress and therefore increasing the service life, making it possible for thinner and accordingly more cost effective filter materials to be used.

The alloy metal foam also lends itself to applications in exhaust aftertreatment in the automotive sector, in diesel locomotives, stationary diesel units, and wherever diesel engines are employed. When used as a substrate for diesel particulate filters (DPF), the combination of different porosities and the number of layers of foam allows the rate of filtration to be set according to requirements. The permanent deflection of the gas causes a turbulent stream compared with ceramic substrates, through which high efficiencies are achieved together with the large reactive surface. When used in diesel oxidation catalysts (DOC) this improves the catalytic functionality and significantly reduces the need for precious metals.

In silencers in combustion engines and armament systems, for example, the alloy metal foam offers higher sound and noise absorption compared with conventional glass, mineral and steel-fibre substrates.

Thanks to its high temperature resistance, the foam material can play to its strengths as a spark separator or spark blocker in extraction systems for weld smoke, for example. In gas heating systems and ceramic hobs, it contributes to optimum combustion and heat distribution thanks to the even distribution of the flame. Metal sandwich structures can also be produced with the alloy foams, for example, for heat exchangers. The special properties of the alloy metal foam also make it interesting for hydrogen conversion and as a material for bipolar plates in fuel cells, for example.

Adaptable also in design

A further benefit of the Alantum material is its free moulding properties that, compared with conventional sintering materials, are also retained even after the coating process. The alloy metal foam can be trimmed, moulded, bent, rolled and stacked. It is also possible to mould the material "green" (unsintered). At the same time, several foam mats, even in different porosities, can be stacked, moulded to the required 3D design or trimmed and coated in the sintering process to form a complete component. This enables the shape and size of components to be adapted or optimised to the required space. The flexibility in terms of design and coating also enables several functions to be integrated into one component, like the combination of DOC and DPF.

Compared with ceramic materials, pipes and sheets can be sintered directly without costly reinforcement mesh. Connections with other metallic components are made using conventional jointing processes, such as laser or arc welding. Equally, recycling the pure metallic material without environmentally harmful materials is not a problem.

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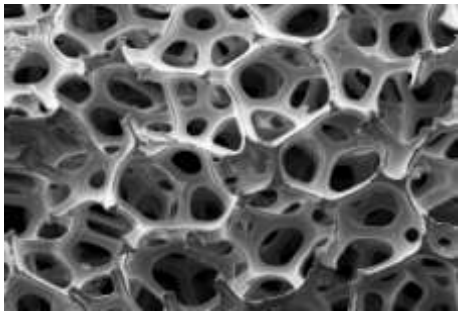
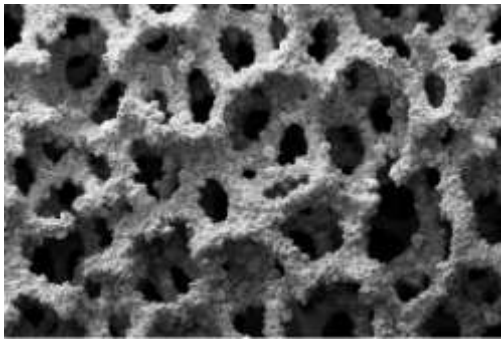
Captions
uncoated foam/coated metal alloy foam
The nickel and iron-based metal foam is converted to an alloy metal foam by coating it with optimised high-alloy metal powders. This gives a significantly enlarged specific surface.



Metal foam uncoated



Coated metal alloy foam

Photo: Sintering process

These filter components emerge from individual metal foam layers that have been moulded and trimmed as a “green” (unsintered) part. The homogenous alloy metal structure is formed in the sintering process. At the same time, the individual layers are sintered to form one complete component.

Photo: Alantum sandwich

Lightweight, metallic sandwich structures can be manufactured from the alloy metal foam that is also suitable for heat exchangers.

About Alantum

Alantum Europe GmbH, founded in 2005, is a subsidiary of the Korean Alantum Corporation, which is in turn a subsidiary of Korea Zinc and Korea Nickel Corporation. Research and development, together with the manufacture and sale of products for the automotive industry, form part of the core areas of expertise, particularly in the field of exhaust gas control and aftertreatment of combustion engines. Catalyst coated alloy foam serves as a base product here. Applications of the alloy metal foam in the industrial sector include fuel cells, reformer technologies, filter systems, silencers and SCR systems, and additional areas of focus.

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