Claims

1. A process for producing a metal foam body, comprising the following steps:

(a) providing a metal foam body A made of nickel, cobalt, copper or alloys or combinations thereof,

(b) applying an aluminum-containing material MP to metal foam bodies A so as to obtain metal foam bodies AX,

wherein the aluminum-containing material MP is an aluminum-containing powder, and an organic binder is applied to metal foam body A together with, or before, the aluminum-containing powder,

(c) treating metal foam bodies AX thermally, with exclusion of oxygen, in order to achieve alloy formation between the metallic components of metal foam body A and the aluminum-containing material MP so as to obtain metal foam body B,

wherein the duration H of the thermal treatment (in minutes), depending on the temperature T of the thermal treatment (in °C), is chosen as follows:

Hmin < H < Hmax, with

maximum duration H_{max} = d1 + (a1 – d1) / (1 + (T / c1)^b1), and

minimum duration H_{min} = d2 + (a2 – d2) / (1 + (T / c2)^b2),

where
a1 = 366.1;
b1 = 129.0;
c1 = 650.9;
d1 = 8.7;

a2 = 33.5;
b2 = 235.5;
c2 = 665.8;
d2 = 1.8;

wherein the temperature T of the thermal treatment, depending on the thickness D of the metal foam body AX, is chosen as follows:

when 0 mm < D ≤ 10 mm, 600°C < T ≤ 680°C,
when 10 mm < D ≤ 20 mm, 600°C < T ≤ 675°C,
when 20 mm < D ≤ 30 mm, 600°C < T ≤ 665°C,
when 30 mm < D, 600°C < T ≤ 660°C;

and wherein the thickness D of the metal foam body AX is determined as follows:

for metal foam bodies with simple geometry, such as cuboid cut-outs of metal foam mats, D denotes the length of the shortest edge of such cut-outs;

for objects with more complicated geometry, D is estimated to be twice the value of the shortest distance from the surface of the body to a point within the body, where said point within the body is selected such that its shortest distance from the surface of body is the maximum as compared to those of other points within the body; and

in each case, the determination of D should neglect the foam pores and their surfaces, that is, the foam pores should be considered to be filled for this determination and recesses of the bodies under consideration with diameters below 1 cm should not be considered as surfaces, but also as filled areas.

2. The process as claimed in either of claims 1, wherein metal foam body A consists of nickel.

3. The process as claimed in any of claims 1 to 2, wherein metal foam body A has an apparent density in the range from 100 to 1500 kg/m^3, preferably from 200 to 1200 kg/m^3 and more preferably from 300 to 600 kg/m^3.

4. The process as claimed in any of claims 1 to 3, wherein metal foam body A has a specific BET surface area of 100 to 20 000 m^2/m^3, preferably of 1000 to 6000 m^2/m^3

5. The process as claimed in any of claims 1 to 4, wherein metal foam body A has a porosity of 0.50 to 0.95.

6. The process as claimed in any of claims 1 to 5, wherein the aluminum-containing material MP in step (b) contains metallic aluminum in an amount of 80% to 100% by weight, preferably of 80% to 99.8% by weight and more preferably of 90% to 99.5% by weight, based on the aluminum-containing material MP.

7. The process as claimed in any of claims 1 to 6, wherein the aluminum-containing material MP is a powder composed of particles, 95% of which have a diameter in the range from 5 to 75 µm.

8. The process as claimed in any of claims 1 to 7, further comprising the following step:

   (d) activating the metal foam body B by treatment with a leaching agent.

9. The process as claimed in claim 8, wherein the treatment of the metal foam body B with leaching agent is performed for a period in the range from 5 minutes to 8 hours at a temperature in the range from 20 to 120°C, and wherein the leaching agent is an aqueous NaOH solution having an NaOH concentration between 2% and 30% by weight.

10. The process as claimed in any of claims 8 to 9, further comprising the following step:

    (e) post-doping the activated metal foam body B with a promoter element, preferably selected from Mo, Pt, Pd, Rh, Ru, Cu and mixtures thereof.