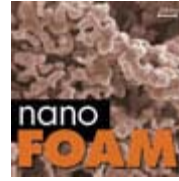




WINNER



2005 R&D 100 Awards Winner

nanoFOAM: A Metal-Nanofoam Fabrication Technique

We developed the nanoFOAM technique to produce self-supporting, nanoporous metal foams by igniting a pressed pellet of a special compound in an inert atmosphere. The compounds are high-nitrogen transition-metal complexes synthesized with a low-cost, high-volume method that we developed. Nanofoams produced to date include iron, cobalt, copper, and silver. The nanofoams have pore diameters of 20 nanometers to 1 micrometer, surface areas as high as 258 meters-squared per gram, and densities as low as 0.01 gram per cubic centimeter. These values compare favorably with those of silica aerogels, the lightest known solids.

Applications

Nanofoams could be used to improve the efficiencies of

- the catalytic production of ammonia, sulfuric acid, fuels, plastics, and other chemicals and products;
- oil-refining processes and electrical generation from fuel cells that run on hydrocarbons; and
- silver biocidal filters that destroy liquid or airborne germs on contact.

Nanofoams could also be used to

- improve the strength and heat-transfer properties of jet-turbine blades while decreasing their weight;
- reduce emissions of nitrogen oxides from internal combustion engines and coal-fired power plants;
- remediate chlorohydrocarbons in the environment; and
- enhance the sensitivity of biomedical detectors.