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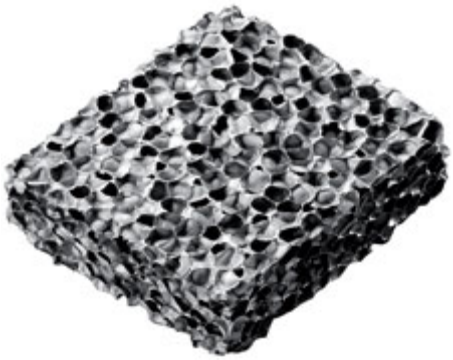
Aluminum Foam

This new technique for producing aluminum foam with uniform cells could make thinner impact-absorbing products.

By Wade Roush



Uniform cell sizes help Metcomb's foam absorb impacts evenly. (Courtesy of Metcomb Nanostructures.)

When a speeding object strikes a piece of plastic foam such as polystyrene, the work required to crush the walls of the millions of air cells in the foam slows the object down. That's why polystyrene is ideal for use in bicycle helmets and other protective gear.

Metals such as aluminum can also form foams -- and because of their greater rigidity, they could, in theory, dissipate as much energy as a polymer foam in a much thinner layer.

In practice, however, it's been impossible to manufacture metal foams with the uniform cell sizes needed to spread out an impact evenly.

Now an Austrian company has developed a way to make aluminum foam with evenly sized cells, potentially opening the way to safer automobiles with metal-foam parts such as door side-impact beams. "Cellular aluminum has a number of advantages that no other metal has," says Gerald Högl, CEO of Schwarzenau-based Metcomb Nanostructures. "It's strong, light, energy absorbing, vibration and noise absorbing, nontoxic, and 100 percent recyclable."

Metcomb's engineers keep the cells in their foam uniform by adjusting the nanoscale oxide layer on the cell surface and by adding small-scale particles to molten aluminum, which controls its viscosity and hence the size of the bubbles that form inside it.

Engineer Jörg Wellnitz, vice dean at the University of Applied Sciences in Ingolstadt, Germany, and a member of Metcomb's scientific advisory board, will use Metcomb's foam to try to develop impact-absorbing car doors and armor for vehicles and buildings.

"Due to the fact that we can go from cell sizes of about two millimeters up to twelve or more, we can finely adjust the foam's impact-absorbent properties," says Wellnitz, who believes the material's first commercial application will be to protect against terrorist blasts.