

## **From Small Things: Big Differences**

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June 2008

### **Light & Strong (But Not Sweet)**

A honeycomb structure provides a combination of light weight, due to the amount of air between the cells, and strength, due to the configuration of the walls of the cells. Nature is clever.

This type of structure is essentially the means by which CellTechMetals ([www.celltechmetals.com](http://www.celltechmetals.com); San Diego) is able to produce metal sandwiches (not wax) that are significantly lighter than solid sheets yet provide comparable bending stiffness.

According to Dr. Dirk Mohr of CNRS and École Polytechnique, an 0.84-mm metallic sandwich structure is 45% lighter than a comparable solid sheet, and a 2.78-mm sandwich is 68% lighter than the solid. Another advantage of the honeycombesque material is improved energy absorption in crash situations. According to Mohr, he and his academic colleagues have determined that energy absorption is 70% higher for the sandwich compared to the comparable solid. In a three-point bending test they've determined the energy absorption to be 120% higher.

Mohr says that a sandwich could be constructed of two 0.2-mm sheets, one for the top and one for the bottom and two additional sheets that are press formed such that they each have a dimpled surface. These sheets are bonded to the outer sheets and aligned such that the dimples are aligned, then brazed. This center section of the sandwich would measure, say, 1.2-mm. Admittedly, this is not a hexagonal form like an actual honeycomb, but the effect is similar.

CellTech has developed a variety of commercially available steel sheets that have a cellular structure. Doug Cox, company president and CEO, says that these materials, although borne of aerospace applications, have direct applicability to automotive structures, as they can be spot welded and even formed without having to make significant changes to existing processing equipment.

As the drive continues to reduce overall vehicle mass, engineers can take a lesson from the bees.