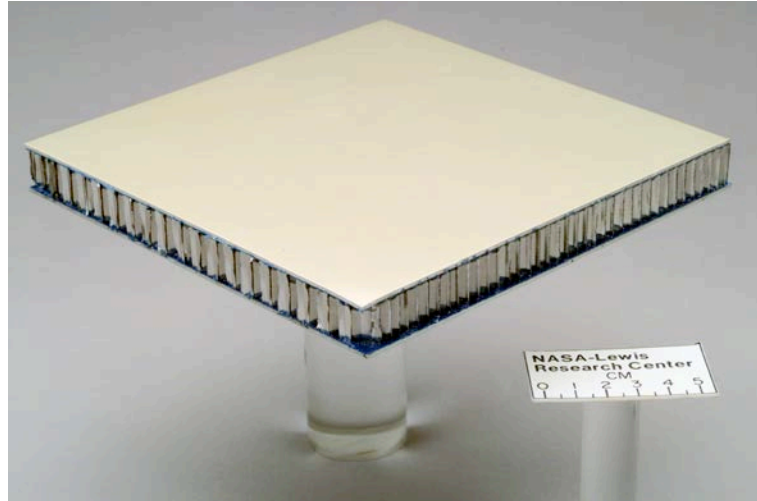


Honeycomb Structures: Overview

Summary

This laboratory learning activity (LLA) has its origin in materials science; specifically, in research aimed at improving the rate of production of carbon fibre composite materials.

A common aim of materials scientists and engineers is to create materials with the greatest strength and the minimum weight and minimum amount of materials (minimum cost). Honeycomb sandwich structures are often used to achieve these outcomes and are used in aerospace, automotive, housing, packaging, sports-equipment and other industries.



Glass aluminum reinforced (GLARE) honeycomb composite sandwich structure.

Photograph has been used and redistributed under an educational non-commercial licence by permission of NASA.

<https://commons.wikimedia.org/wiki/File:Glare_honeycomb.jpg>

A honeycomb structured material is produced using an array of hollow tubes or cells (usually) sandwiched between two solid walls. At the Institute of Frontier Materials scientists have produced and tested a honeycomb sandwich structure made from two layers of carbon fibre composite separated by a honeycomb layer of Kevlar.

While the hexagonal shape of true honeycomb is usually the strongest shape. The cells could be tubular, triangular or square shaped.

This is an open-ended inquiry activity in which students can devise their own question to test, devise a method, conduct tests, collect and analyse data and report their findings

Students might test different cell sizes, different shapes, different thicknesses of the honeycomb sandwich and so on.

Curriculum Outcomes: Australian Curriculum - Science F-10 [Footnote ¹]

Years 5 and 6

Science as a human endeavour: Use and influence of science

- Scientific knowledge is used to solve problems and inform personal and community decisions (ACSHE083 & ACSHE100)

Year 7

Science as a human endeavour

- People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity (ACSHE121)

Science Understanding: Physical Sciences

- Change to an object's motion is caused by unbalanced forces, including Earth's gravitational attraction, acting on the object (ACSSU117)

¹ <http://www.australiancurriculum.edu.au/science/curriculum/f-10?layout=1#level5>

Year 8

Science as a human endeavour

- People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity (ACSHE136)

Science Understanding: Chemical Sciences

- Properties of the different states of matter can be explained in terms of the motion and arrangement of particles (ACSSU151)

Curriculum Outcomes: Australian Curriculum - Design Technologies

Years 5 and 6

Design Technologies

- Explore the characteristics and properties of materials and components that are used to produce designed solutions (ACTDEK004)

Curriculum Outcomes: Victorian Curriculum F-10

[Footnote ²]

Levels 5 and 6

Science Understanding: Science as a human endeavour

- Scientific understandings, discoveries and inventions are used to inform personal and community decisions and to solve problems that directly affect people's lives (VCSSU073)

Science Understanding: Chemical sciences

- Solids, liquids and gases behave in different ways and have observable properties that help to classify them (VCSSU076)

² <http://victoriancurriculum.vcaa.vic.edu.au/Print>

Levels 7 and 8

Science Understanding: Science as a human endeavour

- Scientific knowledge and understanding of the world changes as new evidence becomes available; science knowledge can develop through collaboration and connecting ideas across the disciplines and practice of science (VCSSU089)
- Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations (VCSSU090)

Science Understanding: Chemical Sciences

- The properties of the different states of matter can be explained in terms of the motion and arrangement of particles (VCSSU096)
 - modelling the arrangement of particles in solids, liquids and gases.

Science Understanding: Physical sciences

- Change to an object's motion is caused by unbalanced forces acting on the object; Earth's gravity pulls objects towards the centre of Earth (VCSSU103)
 - investigating the effects of applying different forces to familiar objects.

Curriculum Outcomes: Victorian Curriculum – Technologies F-10 [Footnote ³]

Design and Technologies: Technologies Contexts

- **Engineering principles and systems.** Analyse how motion, force and energy are used to manipulate and control electromechanical systems when designing simple, engineered solutions (VCDSTC045)
 - experimenting to select the most appropriate principles and systems on which to base design ideas, for example structural components to be tested for strength
- **Materials and technologies specialisation.** Analyse ways to produce designed solutions through selecting and combining characteristics and properties of materials, systems, components, tools and equipment (VCDSTC048)

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³ <http://victoriancurriculum.vcaa.vic.edu.au/level8?layout=1&d=DE>

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