teachers guide

Structure and bonding 1: Molecular structures

Components

	NAME	DESCRIPTION	AUDIENCE
	Molecular structures teachers guide	This shows how the resource may be used to engage students' interest in structure and bonding by examining the use of mesoporous silica capsules in drug delivery.	teachers
	Building with molecules video	Concepts of structure and bonding are introduced through current research at The University of Western Australia into how mesoporous silica capsules could be used for drug delivery.	students
	Building with molecules worksheet	This student worksheet is for use with the video *Building with molecules*.	students

Purpose

To **Engage** students' interest in structure and bonding by examining silica capsules, and their potential use in drug delivery.

Outcomes

Students will be able to:

- describe the bonding capacity of silicon,
- link properties of a material to its structure and uses, and
- describe how scientists can apply their knowledge to solve real world problems.

Activity summary

ACTIVITY	POSSIBLE STRATEGY
Show the video *Building with molecules*. Use the questions below to raise issues relating to structure and bonding.	small groups

Technical requirements

The teachers guide requires Adobe Reader (version 5 or later), which is a free download from www.adobe.com.

The videoclip *Building with molecules* is provided in two formats: on a standard DVD-video disk and as a QuickTime movie. QuickTime version 7 or later is required to view the movie. This is a free download from www.apple.com/quicktime.

Using the video

Play the videoclip *Building with molecules.* Discuss it with students to draw out the idea that scientists can manipulate elements and compounds to produce materials with specific properties.

Student discussion following the videoclip can be teacher-led as a whole group discussion, or in small groups using strategies such as Think, Pair, Share.

Suitable discussion questions are outlined on the *Building with molecules* worksheet, or students could be asked to write three of their own questions during or after the videoclip. Students should aim to write one question of each of the types listed below:

- a question with the answer in the video ('In what form does the element silicon usually occur?');
- a question with the answer not directly from the video ('Why is research being carried out using curcumin in the mesoporous silica capsules?'); and
- a question without a correct answer ('How might mesoporous silica capsules be used in the future?').

Students should share their questions with the class and thereby raise issues, relating to the video, from their perspective. These discussions provide a springboard into the **Explore** activity relating properties to the bonding of materials.

Associated SPICE resources

Structure and bonding 1: Molecular structures may be used in conjunction with related SPICE resources to address the broader topic of structure and bonding.

DESCRIPTION	LEARNING PURPOSE
Structure and bonding This learning pathway shows how a number of SPICE resources can be combined to teach the topic of structure and bonding.	
Structure and bonding 1: Molecular structures A short video introduces the concept of structure and bonding by looking at how silica capsules may be used in drug delivery.	**Engage**
Structure and bonding 2: Exploring conductivity Students perform experiments to examine the conductivity of various materials, and sort them into groups.	**Explore**
Structure and bonding 3: Chemical bonds Students learn about types of bonding by working through a learning object and worksheet.	**Explain**
Structure and bonding 4: Molecules by design Students learn about different applications of bonding through a series of fact sheets on current research at The University of Western Australia.	**Elaborate**

Credits for video, *Building with molecules*

- 'Earth from space' by NASA/Lewis Research Center, PD-USGOV-NASA, grcimagenet.grc.nasa.gov/GRCDigitalImages/1990/1990_07066L.jpg
- 'Earth image from NASA's Terra satellite' by NASA/GSFC/METI/ERSDAC/JAROS, and U.S./Japan ASTER Science Team. PD-USGOV-NASA, photojournal.jpl.nasa.gov/catalog/PIA03898
- 'Perspective with Landsat overlay' by NASA/JPL. PD-USGOV-NASA, photojournal.jpl.nasa.gov/catalog/PIA02775
- 'Silicon wafer with a mirror finish' by NASA, PD-USGOV-NASA.
- '*Navicula bullata*' by Ernst Haeckel. PD, commons.wikimedia.org/wiki/File:Navicula_bullata_-_Haeckel.jpg
- 'Amethyst' by Todd Petit. CC-BY-2.0, www.flickr.com/photos/starmist1/220701529/
- 'Opal' by JJ Harrison. CC-BY-SA-2.5, commons.wikimedia.org/wiki/File:Opal_from_Yowah,_Queensland,_Australia.jpg
- 'Carbon-silicon carbide fiber panel' by NASA Glenn Research Center. PD-USGOV-NASA, nix.ksc.nasa.gov/info?id=C-2004-01562&orgid=2
- 'Silicon carbide chunk' by Steve Karg. CC-BY-2.5, en.wikipedia.org/wiki/File:Silicon_carbide_chunk.jpg
- 'Silicone toy' by pinki. CC-BY-2.5, www.flickr.com/photos/55638925@SiN00/375409352/
- Silicon city 2' by Maciej (Mat) Radoszewski. CC-BY-NC-2.5, www.flickr.com/photos/fantomdesigns/2299894322/
- stock images of of pills: morgueFile
- 'Pills' by Darren Hester. Used by permission. www.flickr.com/photos/ppdigital/2054205021/
- 'Just Got Feet, Don't Got Shoes', written and performed by Derek R Audette, © 2004 (Socan). CC, derekaudette.ottawaarts.com
- additional photos by Paul Ricketts, Nigel Clifford and Dr Iyer Swaminathan.

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Web: spice.wa.edu.au
Email: spice@uwa.edu.au
Phone: (08) 6488 3917

Centre for Learning Technology (M016)
The University of Western Australia
35 Stirling Highway
Crawley WA 6009