

## ROCKET LAB ACTIVITY PLAN: COMPOSITE MATERIALS

25 MINUTES PLUS 4 HOURS FREEZING TIME PLUS 20 MINUTES

### GOAL

Students learn that composite materials are made by combining two different materials and that composite materials can have different properties to the starting materials. Students learn the meaning of the word reinforcement and apply this to examples of everyday reinforced materials such as concrete or carbon fibre.

### LEARNING OUTCOMES

1. Appreciate that scientists ask questions about our world that lead to investigations and that open-mindedness is important because there may be more than one explanation.
2. Extend their experiences and personal explanations of the natural world through exploration, play, asking questions, and discussing simple models.
3. Explore and act on issues and questions that link their science learning to their daily living.
4. Observe, describe, and compare physical and chemical properties of common materials and changes that occur when materials are mixed, heated, or cooled.
5. Find out about the uses of common materials and relate these to their observed properties.

### VOCABULARY

Composite material, reinforcement

### MATERIALS

- Plastic or foil tray
- Water
- Newspaper
- Hammer
- Freezer
- Paper towel

### ACCESSING PRIOR KNOWLEDGE (5 MINUTES)

#### States of Matter:

Students recall the 3 states of matter – solid, liquid and gas.

In small groups, students act out being solid particles (close together, still, touching shoulders), liquid particles (small shaking movements, half an arms length apart), and gas particles (big shaking movements, 1-2 arms length apart).

### NEW INFORMATION PRESENTED (5 MINUTES)

Composite materials can be made by combining two different materials together. They are most commonly made by combining a liquid and a solid. Composite materials can have different properties to their ingredient materials. What are some composite materials around us and what are they used for?

## NEW INFORMATION PRESENTED (5 MINUTES) - CONTINUED

### Common composite materials and their uses:

- Mud bricks – mud and straw – building materials
- Concrete – Cement, sand and small rocks – building materials
- Reinforced concrete – Concrete with metal rods – building materials
- Fibreglass – Glass fabric and plastic resin – surfboards, boats
- Carbon fibre – Carbon fabric and resin – racing cars, baseball bats, rockets

Reinforcement is the name given to a material added to something else to give it strength. Composite materials are made by adding reinforcement to the original material to make it stronger.

Rocket Lab's Electron rocket is made from composite materials. The fuel tanks are made from carbon fibre because it is strong but also very light.

## ACTIVITY

### MAKING COMPOSITE MATERIALS (15 MINUTES + 15 MINUTES)

#### STUDENT WORKSHEET: WHY IS THE ELECTRON ROCKET BLACK?

##### Part one

- Divide students into groups of 4. Each group should label 2 trays with their name.
- Cut sheets of newspaper roughly to the size of the bottom of the tray (student decides how many)
- Take one tray and fill 2cm deep with water
- Take a second tray and just cover the bottom with water
- Add one sheet of newspaper
- Add another thin layer of water and a sheet of newspaper until the students use the chosen number of sheets
- Top up the water level to 2cm
- Freeze both trays for at least 4 hours or until frozen solid

##### Part two

- Remove from freezer and distribute to each group
- Remove the ice blocks from the trays and place on table
- Students hit each block with a hammer and observe the damage
- Within their group, students discuss: Which block was stronger? Why do you think that?
- Between groups, students compare their results and discuss the number of sheets each group used. Did the other group use more or less sheets? Was it stronger or weaker than your newspaper ice block?
- Students dispose of ice blocks and clean their workspace

## GOAL REVISITED (5 MINUTES)

One student from each group presents their findings to the class, making sure to include the vocabulary learned, and a real world example of a composite material.

# WHY IS THE ELECTRON ROCKET BLACK?

The Electron rocket is black because it is made from carbon fibre. Carbon fibre is a composite material. Composite materials can be made by combining two different materials together. Composite materials can have different properties to their ingredients.

Fill in the missing letters below to work out which composite material is made from the ingredients listed, and what they are used for.

M \_ \_ B \_ I \_ K S : Mud and straw – buildings

\_ \_ N C \_ \_ T E : Cement, sand and small rocks – buildings

RE \_ \_ F \_ \_ C E D C \_ \_ C R E T E : Concrete with metal rods – buildings

F I B R E G \_ \_ S S : Glass fabric and plastic resin – surfboards, boats

C \_ \_ B \_ N F \_ \_ R E : Carbon fabric and resin – racing cars, baseball bats, rockets

## CREATE YOUR OWN COMPOSITE MATERIAL

What ingredients did you use to make your composite material?

Which block was stronger (circle your answer)?

With newspaper

No newspaper

Why?

Which material was the reinforcement?

How could you make your composite material even stronger?

Draw an object that is made from composite materials