



## Main matrices and reinforcements used in composites

Matrix or reinforcement	Properties sought
Plastic matrix	<ul style="list-style-type: none"> <li>• Durability</li> <li>• <u>Lightness</u></li> <li>• <u>Resilience</u></li> <li>• <u>Low cost</u></li> </ul>
Metallic matrix	<ul style="list-style-type: none"> <li>• <u>Ductility</u></li> <li>• <u>Thermal and electrical conductivity</u></li> <li>• <u>Stiffness</u></li> </ul>
Ceramic matrix	<ul style="list-style-type: none"> <li>• <u>Durability</u></li> <li>• <u>Heat resistance</u></li> </ul>
Fibreglass reinforcement	<ul style="list-style-type: none"> <li>• <u>Stiffness</u></li> <li>• <u>Corrosion resistance</u></li> </ul>
Aramid fibre reinforcement	<ul style="list-style-type: none"> <li>• <u>Low density</u></li> <li>• <u>Resilience</u></li> </ul>
Carbon fibre reinforcement	<ul style="list-style-type: none"> <li>• <u>Stiffness</u></li> <li>• <u>Low density</u></li> <li>• <u>Electrical conductivity</u></li> </ul>

## Degradation and protection of composites

The degradation of composites usually takes one of two forms:

- the deformation or fracture of the matrix or the reinforcements.

- a loss of adherence between the matrix and the reinforcements.

To protect materials, it is important to:

- choose materials that are not likely to become deformed or break.

- assure a strong adherence between the matrix and the reinforcements.





## Plastics and composites

You will need Appendix 5 in the textbook, which is reproduced on page 268 of this book and on the inside back cover, to answer Question 2.

- Today, plastics are among the most commonly used materials.

- From what natural resources are most plastics made?

Petroleum and natural gas.

- Give examples of objects made in whole or in part from plastics.

Answers will vary. Examples. Soft drink bottles, food containers, window ledges,

plumbing pipes, etc.

- Which subcategory does a plastic belong to when its shape can no longer be altered once it has hardened?

Thermosetting plastic.

- Which subcategory does a plastic belong to when it becomes soft when heated, allowing it to be given a new form?

- Which subcategory of plastics is the most widely used in the world today?

Thermoplastic.

1. Name three plastics that can be recycled when disposed of correctly in a recycling box and when the necessary facilities exist. Specify the recycling code number for each.

polyvinyl chloride (3), polypropylene (5) polystyrene (6).

-  Name a possible cause of the degradation of the plastics in the following situations.

- 👉 In a sunny kitchen, a microwave door has yellowed.

ultraviolet rays.

- A faded plastic toy has been left at the bottom of the pool.

- A tarnished plastic test tube contains a corrosive gas.

### Oxidation

- ✱ A concentrated solution of sulphuric acid rapidly degrades certain plastics.

Penetration by a liquid.

- A plastic weathervane on a roof is discoloured.



3. A composite material has two components: a matrix and a reinforcement. Identify the matrices and reinforcements in the following cases.

- a) Fibreglass is often used as a framework in the resin support posts of swimming pools (resin is a thermosetting plastic).

Matrix: plastic.

Reinforcement: fibreglass.

- b) In building foundations, iron rods are installed in concrete walls, making what is known as reinforced concrete.

Matrix: concrete.

Reinforcement: iron rods.

- c) Most walls in our homes are covered with sheets of drywall, which are made from plaster pressed between two sheets of thick paper.

Matrix: sheets of thick paper.

Reinforcement: plaster.

4. What am I? Identify the matrices and reinforcements in the following statements.

- a) It is often called resin.

Plastic matrix.

- b) It is used to increase a material's corrosion resistance.

Fibreglass.

- c) They are obtained by carbonizing polymers.

Carbon fibres.

- d) They are the main plastics used as a reinforcement.

Aramid fibres.

- e) It is chosen for its heat resistance.

Ceramic matrix.

- f) It is often made from glass.

Ceramic matrix.

5. The following statements concern the properties of plastics. Indicate whether they are true or false and support your answer with two properties.

- a) Polypropylene is used in the manufacturing of motor oil.

True. It is waterproof and resistant to penetration by oil and grease.

- b) Polyamides are excellent for making water pitchers.

False. They are soft and water-absorbent.

- c) Food packaging is made from polyethylenes.

True. This plastic is easy to cut and is flexible.

