Name: _____ Group: _____ Date: _____

CONCEPT REVIEW 51

Plastics and composites

EST

PAGES 396–401

Complete this concept review handout and keep it as a record of what you have learned.

Definitions

- A plastic is *a material made of polymers, to which other substances may be added to obtain certain desirable properties.*
- A thermoplastic is *a plastic that becomes soft enough when heated to be moulded or remoulded and that hardens enough when cooled to hold its shape.*
- A thermosetting plastic is *a plastic that remains permanently hard, even when heated.*
- A composite is *formed by combining materials from different categories to obtain a material with enhanced properties.*

Degradation and protection of plastics

Cause of degradation	Description	Example of protection
Penetration by a liquid	*Substances in the liquid state (such as water) or solutions (such as an acid) can penetrate certain plastics.*	*Waterproof coating*
Oxidation	*Oxygen and other gases can react with the polymers in certain plastics.*	*Addition of antioxidants, such as carbon black*
Ultraviolet rays	*UV rays can damage plastic polymers.*	*Addition of pigments that absorb ultraviolet rays*

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Main matrices and reinforcements used in composites

Matrix or reinforcement	Properties sought
Plastic matrix	• Durability • *Lightness* • *Resilience* • *Low cost*
Metallic matrix	• *Ductility* • *Thermal and electrical conductivity* • *Stiffness*
Ceramic matrix	• *Durability* • *Heat resistance*
Fibreglass reinforcement	• *Stiffness* • *Corrosion resistance*
Aramid fibre reinforcement	• *Low density* • *Resilience*
Carbon fibre reinforcement	• *Stiffness* • *Low density* • *Electrical conductivity*

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.*