CH170-15 Plastics: the good, the bad, and the future

26/27

Department
Chemistry
Level
Undergraduate Level 1
Module leader
Stefan Bon
Credit value
15
Module duration
10 weeks
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

Description

Introductory description

In the 20th century polymer science gave us materials with remarkable and durable properties to the great benefit of humanity. Plastics were fantastic. Now, a green polymer (r)evolution is urgently needed so that plastics will be the material that rebalances the needs and prosperity of humanity with the environmental and sustainable needs of our planet. This module will discuss how different types of plastics are made, what they are used for and why they are the current material of choice. It will discuss the environmental sustainability challenges that we face and how we can find an environmental sustainable way forward to live in harmony with a healthier planet.

Module aims

The overall module aim is to provide participants with the knowledge on what polymers are, how they are made, why they are used, and why they will play a key role in the challenge of this generation of humanity to provide for a greener and environmentally sustainable planet.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

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BLOCK 1 A brief history of polymer science and an overview of global polymer production. Introduction to key polymer chemistry, physics, and engineering; reinforced with more depth for particular polymers in blocks 2-4. [Note that this block will enrich the chemistry UG participant with information NOT provided in year 1 and 2 UG polymer and macromolecules teaching]

BLOCKS 2, 3, and 4. will discuss a selection of particular types of polymers and their products: How are they made, what are their key physical and mechanical features, what are they used for and why? What are the sustainability ideas and challenges? Polymers that can be discussed are:

Poly(olefins): PE/PP
Poly(vinyl chloride): PVC
Polyesters/amides with a focus on PET
Polymer composites (epoxy resins/ poly(urethanes))
Polymer dispersions and their applications

BLOCK 5: The Green Polymer (R)evolution: what are the scientific/societal issues and where do we go from here?

Learning outcomes

By the end of the module, students should be able to:

- Understand some key concepts of polymer science developing knowledge in the area of polymer science and being able to feed this back into underpinning areas such as chemistry, chemical engineering, physics, manufacturing, environmental and socio-economic impact.
- Evaluate diverse points of view on technological/scientific contexts, societal and environmental impact, temporal and trending contexts.
- Engage in inquiry and build a skill set to process, understand, and communicate/explain and evaluate scientific principles and their impact.
- Apply and integrate concepts introduced during the module in an interactive discussion format.
- Effectively verbally communicate and present their ideas.
- Think about the reason for the use (or not) of polymer materials in contemporary society.

Indicative reading list

Specific reading list for the module

Subject specific skills

The students will have developed the skills to:
Evaluate scientific principles and their impact.
Assess the social and environmental impact of plastics.

Evaluate designs and assess the pros and cons for the use of polymer materials.
Communicate clearly their understanding of current scientific principles relating to polymers and their impact.

Transferable skills

Numeracy
Problem solving
Critical thinking
Teamwork

Study

Study time

Type	Required
Lectures	10 sessions of 3 hours (60%)
Private study	20 hours (40%)
Total	50 hours

Private study description

Read study material, prepare for discussion classes

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group A

	Weighting	Study time	Eligible for self-certification
Group project: 120 second industrial case study	30%	30 hours	No

Throughout the module, the students will undertake a group project, which will be presented on the seminar day (1 full day, 8-10 hours in Term 3)
Your group will design a 2 mins (120 s) movie on a particular polymer/plastic product. You will

	Weighting	Study time	Eligible for self-certification

discuss how it was discovered, how it is made, and what challenges there are and what vision there is to make it circular/sustainable. You will be given a movie genre (e.g. horror, comedy, sci-fi, documentary, thriller,...) to set the scene for your video.

Individual Poster Presentation	50%	50 hours	No

Each student will be provided with the name of an object that contains polymers/plastics. Your task is to make a poster discussing how the polymer was discovered, why this particular polymer is used in the product, how it is made, and what challenges there are to make the product (or a similar product) circular and environmentally sustainable. You will present your poster on the seminar day (1 full day, 8-10 hours in Term 3), where it will be judged.

Weekly group home work and feedback	20%	20 hours	No

Each week a group task is set. Feedback is provided in class.

Assessment group R

	Weighting	Study time	Eligible for self-certification
Examination	100%		No

Resit examination: notes and internet access allowed.

- Students may use a calculator

Feedback on assessment

Group feedback, cohort feedback

Past exam papers for CH170

Availability

Courses

This module is Optional for:

- UCHA-4 Undergraduate Chemistry (with Intercalated Year) Variants
  - Year 1 of F101 Chemistry (with Intercalated Year)
  - Year 1 of F122 Chemistry with Medicinal Chemistry (with Intercalated Year)
- UCHA-3 Undergraduate Chemistry 3 Year Variants

    - Year 1 of F100 Chemistry
    - Year 1 of F121 Chemistry with Medicinal Chemistry
- UCHA-F110 Undergraduate Master of Chemistry (with Industrial Placement)
    - Year 1 of F100 Chemistry
    - Year 1 of F110 MChem Chemistry (with Industrial Placement)
    - Year 1 of F112 MChem Chemistry with Medicinal Chemistry with Industrial Placement
- Year 1 of UCHA-F107 Undergraduate Master of Chemistry (with Intercalated Year)
- UCHA-F109 Undergraduate Master of Chemistry (with International Placement)
    - Year 1 of F109 MChem Chemistry (with International Placement)
    - Year 1 of F111 MChem Chemistry with Medicinal Chemistry (with International Placement)
- UCHA-4M Undergraduate Master of Chemistry Variants
    - Year 1 of F100 Chemistry
    - Year 1 of F105 Chemistry
    - Year 1 of F110 MChem Chemistry (with Industrial Placement)
    - Year 1 of F109 MChem Chemistry (with International Placement)
    - Year 1 of F125 MChem Chemistry with Medicinal Chemistry
- Year 1 of UCHA-F127 Undergraduate Master of Chemistry with Medicinal Chemistry(with Intercalated Year)