CH415-15 Colloid Science II

21/22

Department
Chemistry
Level
Undergraduate Level 4
Module leader
Stefan Bon
Credit value
15
Module duration
6 weeks
Assessment
25% coursework, 75% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

N/A

Module web page

Module aims

The overall aim of this module is to provide an in-depth study of key topics of colloid science and their underlying and founding physical principles. It is a follow on of the basic CH272 year 2 UG module on materials and polymers and builds on the year 3 UG Polymer and Colloid Science module CH3F6.

The aims are to:

(1) gain a deep understanding of the scientific ideas and concepts associated with three selected core topics (particles at soft interfaces, colloid stability, and rheology).

(2) Apply the gained knowledge in a discussion format to discuss examples of colloidal materials to improve learning.

(3) Place the gained knowledge into a wider scientific context linking to principles of chemistry, chemical engineering, physics, and manufacturing.

(4) Develop a skill set to critically process, understand, and communicate/explain scientific principles and phenomena in the area of colloid science.

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.

The module will provide students with a solid understanding of several fundamental and contemporary aspects of colloid science.

The module is divided into 3 key learning blocks. Note that BLOCKS 1 and 2 are taught as part of CH975 and that content has also been covered by CH3F6 in its blocks 4 and 5:

BLOCK 3: COLLOID STABILITY
After recapping ways to stabilize colloids via electrostatic, steric, or depletion methods, we will look in detail into the DLVO theory. Key words: charged interfaces, van der Waals interactions, Hamaker coefficient, Derjaguin approximation, Coulomb repulsion, double layer, critical coagulation concentration.

BLOCK 4: WETTING AND PARTICLES AT SOFT INTERFACES
We will introduce scientific principles of capillarity. In this context we will focus and explore the phenomenon of Pickering stabilization, in that solid particles have the ability to adhere to a soft (i.e. liquid-liquid or liquid-gas) interface. Key-words: Pickering emulsions, Ore flotation, capillary forces, wetting/de-wetting, interfacial and line tension, contact angle.

BLOCK 5: RHEOLOGY
We will (re-) introduce rheological concepts and apply these to colloidal dispersions. Key words: kinematics and dynamics, shear rate, stress, viscosity. Yield stress, visco-elasticity, shear thinning and thickening. Hydrodynamic effects. Brownian contributions. Flocculation and thixotropy (Reversible time effects).

Learning outcomes

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

- KNOWLEDGE: The module will provide students with a solid understanding of several fundamental and contemporary aspects of colloid science focussing on three key learning blocks (particles at soft interfaces, colloid stability, and rheology: see point 20 for more detail). Students will develop specialized knowledge in the area of colloid science and integrate this across the wider areas of chemistry, chemical engineering, physics and manufacturing.
- APPLIED LEARNING: This module has a designed set of workshops associated with each block of learning in which concepts will be applied and integrated in an interactive discussion format.
- DIVERSE PERSPECTIVES: Through interactive workshops and a group project students will be able to evaluate diverse points of view embedded within varying frameworks which may include, technological/scientific context, societal and environmental impact, temporal and trending contexts.

- COMPETENCY SKILLS: Students will engage in critical inquiry and develop their skill set to process, understand, and communicate/explain and evaluate scientific principles and their impact.
- COMMUNICATION: Student will be able to communicate effectively in presenting ideas orally (especially in the workshop sessions), and in the format of an assessed group presentation
- ETHICAL REASONING: Students will be able to reason ethically in evaluating the design and use of colloidal materials in nowadays society and illustrate their learning in the form of a group project/presentation.

Indicative reading list

Reading lists can be found in Talis

International

e.g. includes mobility opportunities, explores concepts and ideas in a global context, fosters a global mindset and awareness of diversity, etc.

Subject specific skills

Numeracy
Problem solving
Critical thinking
Teamwork

Transferable skills

Numeracy
Problem solving
Critical thinking
Teamwork

Study

Study time

Type	Required
Lectures	6 sessions of 1 hour (4%)
Seminars	1 session of 3 hours (2%)
Practical classes	6 sessions of 2 hours (8%)
Total	150 hours

Type	Required
Online learning (independent)	6 sessions of 5 hours (20%)
Private study	99 hours (66%)
Total	150 hours

Private study description

Independent online learning: study the e-book.
Private study: includes preparation for the group presentation (25%) of the module.

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 D2

	Weighting	Study time	Eligible for self-certification
Assessment component			
Presentation	25%		No
12 minute oral presentation followed by 3-10 mins of questions by the audience.			
Reassessment component is the same			
Assessment component			
Online Examination	75%		No
~Platforms - AEP			

- Answerbook Pink (12 page)

Reassessment component is the same

Feedback on assessment

group feedback on presentations will be provided. Cohort level examination feedback provided via Moodle.

Past exam papers for CH415

Availability

Pre-requisites

To take this module, you must have passed:

- All of
  - CH3F6-15 Polymer and Colloid Science

Courses

This module is Optional for:

- UCHA-F110 Undergraduate Master of Chemistry (with Industrial Placement)
  - Year 4 of F110 MChem Chemistry (with Industrial Placement)
  - Year 4 of F112 MChem Chemistry with Medicinal Chemistry with Industrial Placement
- Year 5 of UCHA-F107 Undergraduate Master of Chemistry (with Intercalated Year)
- UCHA-F109 Undergraduate Master of Chemistry (with International Placement)
  - Year 4 of F109 MChem Chemistry (with International Placement)
  - Year 4 of F111 MChem Chemistry with Medicinal Chemistry (with International Placement)
- UCHA-4M Undergraduate Master of Chemistry Variants
  - Year 4 of F105 Chemistry
  - Year 4 of F110 MChem Chemistry (with Industrial Placement)
  - Year 4 of F109 MChem Chemistry (with International Placement)
  - Year 4 of F125 MChem Chemistry with Medicinal Chemistry
- Year 5 of UCHA-F127 Undergraduate Master of Chemistry with Medicinal Chemistry(with Intercalated Year)