

CH415-15 Colloid Science II

23/24

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 addresses further colloid science in addition to that offered in 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 (wetting and 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	18 sessions of 1 hour (12%)
Seminars	(0%)
Online learning (independent)	6 sessions of 5 hours (20%)
Total	150 hours

Type	Required
Other activity	3 hours (2%)
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.

Other activity description

Group Talk (assessed)

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 D4

	Weighting	Study time	Eligible for self-certification
Assessment component			
Presentation	25%		No
15 minute oral presentation followed by 3-10 mins of questions by the audience.			

Reassessment component is the same

Assessment component			
Colloid Science II	75%		No
<ul style="list-style-type: none"> • Answerbook Pink (12 page) • Students may use a calculator • Periodic Tables 			

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

Colloids II is taught over a 6 week period and is preceded by Colloids I which is taught in the 4 weeks before. Colloids I is part of CH3F6 but not essential for Colloids II. It is however strongly advised to re-familiarise yourself with the material of Colloids I. A good way of doing this is to follow the whole 10 weeks (Colloids I+II). Note that for CH415 only the Colloids II material will be examined.

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)