UNIVERSITY of BRADFORD

Module Descriptor

Advanced Topics in Chemistry: Physical Chemistry of Nanoscience

Module Code:	CFS7007-A
Academic Year:	2018-19
Credit Rating:	10
School:	School of Chemistry and Biosciences
Subject Area:	Chemistry
FHEQ Level:	FHEQ Level 7 (Masters)
Module Leader:	Dr Stephen Hickey

Additional Tutors:

Pre-requisites:

Co-requisites:

Contact Hours

Type	Hours
Lectures	20
Tutorials	4
Directed Study	76

Availability Periods

Occurrence	Location/Period
BDA	University of Bradford / Semester 1 (Sep - Jan)

Module Aims

The aim of this module is to introduce you to the physical chemistry of nanostructures. The role of the material type (metal, semiconductor or insulator(, particle size, surface chemistry (interfacial interactions) and other relavant aspects of nano science will be explored. The application of current theories relating to the description of nanostructural material will be introduced and the implications of such theories evaluated.

Outline Syllabus

The underlying electronic nature of materials

The effects of quantum confinement (Q.C.) within nanomaterials

How one quantifies the Q.C. Effect using the Brus model

The methods employed to synthesise high quality metallic and semiconductor nanomaterials

Methodologies employed to assemble nanoparticles

The role of surface ligands and methods to accomplish their exchange

Characterisation of nanomaterials and their applications by various techniques such as transmission electron microscopy (TEM). scanning electron microscopy (SEM). fluorescence microscopy and X-ray crystallography

The surface of nanomaterials and its significance including surface traps. Surface plasmon resonance. Surface changes e.g. oxidation

The control of the surface for different applications.

Module Learning Outcomes

On successful completion of this module, students will be able to...

1 Explain and critically evaluate the scientific principles that underpin size dependent properties as applied to nano science.

2 Explain the relationship between surface/interfacial forces and material stability in the liquid phase.

3 Explain the significance of particle-particle interactions, in both aqueous and non-aqueous media.

4 Explain the underlying electronic nature of materials, the effects of quantum confinement (q.c.) within nanomaterials and explain how one quantifies the q.c effect using the Brus model.

5 Outline the methods employed to synthesis high quality metallic and semiconductor nanomaterials, methodologies employed to assemble nanoparticles, the role of surface ligands and explain methods to accomplish their exchange and how these may be modified through judicious ligand choices or exchange.

6 Analyse the surface of nanomaterials and its significance to the properties, including surface traps, surface plasmon resonance, surface oxidation, and the control of the surface for different.

7 Critically appraise findings and conclusions in relevant chemical literature.

8 Analyse data obtained from a number of instrumental techniques (absorbance, emission, XRD, EM etc.) as they pertain to nanomaterials and evaluate their relevance as well as their limitations.

Learning, Teaching and Assessment Strategy

Information outlining the knowledge and understanding required for this module is delivered in lectures. The seminars and tutorials will allow you to critically evaluate areas of nanoscience. Students will be given an area for independent study and these will be evaluated in seminars.

Mode of Assessment

Type	Method	Description	Length	Weighting	Final Assess'
Summative	Examination - closed book	one 1.5 hour written examination	1.5 hours	70%	Yes
Summative	Coursework	Critical Review (700 words)	0 hours	30%	No

Legacy Code (if applicable)

CT-4017M

Reading List

To view Reading List, please go to **rebus:list**.