Science Medicine and Health

**AIIM902: EM1: Electromaterials synthesis and characterisation**

**Subject Outline**
Autumn, 2016
Flexible
Innovation Campus

**Subject Information**
Credit Points: 6
Pre-requisite(s): Nil
Co-requisite(s): AIIM903
Restrictions: CHEM991
Contact Hours: As per subject database

**Subject Contacts**
**Subject Coordinator/Lecturer**
<table>
<thead>
<tr>
<th>Name:</th>
<th>A/Prof Attila Mozer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>AIIM.G23</td>
</tr>
<tr>
<td>Telephone:</td>
<td>61 2 4298 1429</td>
</tr>
<tr>
<td>Email:</td>
<td><a href="mailto:attila@uow.edu.au">attila@uow.edu.au</a></td>
</tr>
<tr>
<td>Consultation mode and times:</td>
<td>Email for appointment</td>
</tr>
</tbody>
</table>

**Student Support and Advice**
For general enquiries please contact StudentHub 41:
Location: 41.138B
Telephone: 61 2 4221 3492
Email: smah-students@uow.edu.au
Student Consultation and Communication

University staff receive many emails each day. In order to enable them to respond to your emails appropriately and in a timely fashion, students are asked to observe basic requirements of professional communication:

Consider what the communication is about
- Is your question addressed elsewhere (e.g. in the subject outline or, on the eLearning site)?
- Is it something that is better discussed in person or by telephone? This may be the case if your query requires a lengthy response or a dialogue in order to address. If so, see consultation times above and/or schedule an appointment.
- Are you addressing your request to the most appropriate person?

Specific email subject title to enable easy identification of issue
- Identify the subject code of the subject you are enquiring about (as staff may be involved in more than one subject) put this in the email subject heading. Add a brief, specific query reference after the subject code where appropriate.

Professional courtesy
- Address the staff member appropriately by name (and formal title if you do not yet know them).
- Use full words (avoid ‘text-speak’ abbreviations), correct grammar and correct spelling.
- Be respectful and courteous.
- Allow 3 – 4 working days for a response before following up. If the matter is legitimately urgent, you may wish to try telephoning the staff member (and leaving a voicemail message if necessary) or inquiring at the School Office.
- Please ensure that you include your full name and student number and identify your practical class or tutorial group in your email so that staff know who they are communicating with and can follow-up personally where appropriate.
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Section A: General Information

Subject Learning Outcomes

On completion of this subject, students should be able to:

1. Prepare and characterise different classes of electromaterials, such as conducting polymers, nanocarbons and electrocatalysts and appreciate how a materials properties change as its dimensions are reduced to the nanoscale.

2. Apply the principles of electrochemistry and spectroscopy to assess the charge transport and physical properties of electromaterials.

3. Demonstrate an understanding of the origin of photoactive behaviour in materials and the application of key analytical techniques.

4. Critique the properties of presently used electromaterials and how these can be improved by materials design and modelling.

5. Demonstrate an understanding of the synthesis, characterisation and properties of biomaterials, biopolymers, hydrogels and their integration with electromaterials for use in biomedical applications.

6. Critically analyse the ethical implications of electromaterials research in the areas of energy and medicine.

Subject Description

The subject will introduce students to different aspects of electromaterials synthesis and analysis, with a particular emphasis on emerging functional materials and nanomaterials. The students will learn about materials such as conducting polymers, light harvesting materials (porphyrins, ruthenium complexes), inorganic semiconductors, and nano-dimensional carbon materials including carbon nanotubes, graphene and carbon fibres, which are all of interest for electrochemical device applications. They will also learn about the synthesis and analysis of biomaterials and biopolymers pertinent to medical applications. The students will be introduced to analytical techniques specific to the understanding of electromaterials and biomaterials, such as electrochemistry, bioAFM, NMR, spectroscopy and imaging.

eLearning Space

This subject has materials and activities available via eLearning. To access eLearning you must have a UOW user account name and password, and be enrolled in the subject. eLearning is accessed via SOLS (student online services). Log on to SOLS and then click on the eLearning link in the menu column. For information regarding the eLearning spaces please use the following link: http://uowblogs.com/moodlelab/files/2013/05/Moodle_StudentGuide-1petpo7.pdf

Lecture, Tutorial, Laboratory Times

Dates for study days and weeks will be listed online. All timetable information is subject to variation. Check latest timetabling information on the 'Current Student' webpage on UOW website or log into SOLS to view your personal timetable prior to attending classes. http://www.uow.edu.au/student/index.html

Timetable information can be accessed from http://www.uow.edu.au/student/timetables/info/index.html

Key University Dates can be accessed from http://www.uow.edu.au/student/dates/index.html
Readings, References and Materials

Textbooks
Nil

Prescribed Readings (includes eReadings)
The following readings are prescribed for this subject, but students are not expected to purchase these. They are available to students through the library on the subject's eLearning site.


Materials
The following additional materials are required for this subject, and will be provided as part of the safety induction:
lab coats, lab safety goggles.

Recommended Readings
Students are encouraged to discuss the list of additional references with the subject coordinator / lecturers.

Recommended readings are not intended as an exhaustive list, students should use the Library catalogue and databases to locate additional resources.

Recent Changes to this Subject
Nil

Ethical Objection to the Use of Animal and Animal Products
In order to achieve specific learning objectives, the use of animals, animal tissues, and or animal-derived products (such as sera) is inherent and unavoidable. Students with conscientious objections to this use should not enrol in this subject.

Students who intend to avoid a particular learning activity on the basis of conscientious objection should notify the subject coordinator in writing as soon as possible and not later than the end of Week 1 of the session. Students who do not participate in a particular learning activity are required to complete an alternative exercise (a CD-ROM is available) or attend the practical and “observe”. The material involved is examinable and the prac must be written up and completed in your workbook. For further information, refer to http://www.uow.edu.au/about/policy/UOW058708.html
Laboratory Safety Guidelines
The rules below are general rules that are required in laboratories.

- Before commencing your project you are to ensure that you understand specific procedures for the laboratory in which you work.
- You will need to fill out a risk assessment form before commencing any experiments (confer with your laboratory supervisor).
- Never use any equipment or attempt any experiment without checking the safety implications with your laboratory supervisor or experienced delegated laboratory worker.
- Undergraduate students are not permitted to work after hours unless there is appropriate approval and supervision.

List of Topics Covered
The following are examples of the topics to be covered in this course. This is not an exhaustive list and will be subject to change.

A Timetable of Topics will be available from the eLearning site in week 1 of session.

- Electromaterials - Past, Present, Future
- Synthesis of electromaterials - Comparison of synthetic methods
- Electromaterials - Chemical properties
- Chemical characterisation of electromaterials
- Optical properties of electromaterials – Light absorption, light emission, and colour tuning
- Photo-induced charge separation and charge collection
- Fundamental electrochemical properties
- Advanced electrochemical properties
- Morphology studies of electromaterials
- Mechanical properties of electromaterials
- Electroactive composites
Section B: Assessment

Assessment Summary

<table>
<thead>
<tr>
<th>Assessment Item</th>
<th>Form of Assessment</th>
<th>Due Date</th>
<th>Return/Feedback Due Dates</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment 1</td>
<td>Written Assignments</td>
<td>Wk 13</td>
<td>WK 14</td>
<td>30%</td>
</tr>
<tr>
<td>Assessment 2</td>
<td>Laboratory Exercises/reports</td>
<td>One week after each lab exercise</td>
<td>Two weeks after each lab exercise</td>
<td>45%</td>
</tr>
<tr>
<td>Assessment 3</td>
<td>In-class tests</td>
<td>Wk 7, WK13</td>
<td>WK 14</td>
<td>25%</td>
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<tr>
<td><strong>Total Marks</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>100%</strong></td>
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</tbody>
</table>

Details of Assessment Tasks

Assessment tasks will be marked using explicit criteria that will be provided to students prior to submission.

**Assessment 1**
- **Essay**
  - **Due date**: WK 13
  - **Weighting**: 30%
  - **Submission**: Submit an electronic copy of your assessment via upload to elearning
  - **Type of Collaboration**: Individual Assessment
  - **Length**: TBC
  - **Details**: Students are required to prepare a manuscript following the template that will be provided. This manuscript will incorporate learning from the lectures and laboratory exercise to critically looking at one state-of-the-art aspect of electromaterials synthesis and characterisation.
  - **Style and format**: In a format of a scientific manuscript using the template provided.
  - **Subject Learning Outcomes**
    - Critique the properties of presently used electromaterials and how these can be improved by materials design and modelling.
    - Demonstrate an understanding of the synthesis, characterisation and properties of biomaterials, biopolymers, hydrogels and their integration with electromaterials for use in biomedical applications.
    - Critically analyse the ethical implications of electromaterials research in the areas of energy and medicine.
  - **Marking Criteria**: The marking criteria will be made available on your eLearning site by week 1 of session.

**Assessment 2**
- **Laboratory Exercise / Reports**
  - **Due date**: One week after each lab exercise
  - **Weighting**: 45%
  - **Submission**: Submit a hardcopy to your tutor/demonstrator in class
  - **Type of Collaboration**: Individual Assessment
  - **Length**: Varies depending on the nature of the laboratory exercise, to be confirmed by the tutors of the laboratory exercise.
  - **Details**: Will be provided for each exercise in WK1.
  - **Style and format**: Will be explained in WK 1 as part of the laboratory induction
  - **Subject Learning Outcomes**
    - Prepare and characterise different classes of electromaterials, such as conducting polymers, nanocarbons and electrocatalysts and appreciate how a materials properties change as its dimensions are reduced to the nanoscale.
    - Apply the principles of electrochemistry and spectroscopy to assess the charge transport and physical properties of electromaterials.
    - Demonstrate an understanding of the origin of photoactive behaviour in materials and the application of key analytical techniques.
  - **Marking Criteria**: The marking criteria will be made available on your eLearning site by week 1 of session.
Assessment 3

<table>
<thead>
<tr>
<th>Due date</th>
<th>WK 7, WK13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weighting</td>
<td>25%</td>
</tr>
<tr>
<td>Submission</td>
<td>Submit a hardcopy to your tutor/demonstrator in class</td>
</tr>
<tr>
<td>Type of Collaboration</td>
<td>Individual Assessment</td>
</tr>
<tr>
<td>Length</td>
<td>TBC</td>
</tr>
<tr>
<td>Details</td>
<td>The first in-class test covers material discussed in week 1-6. The second in-class test covers material discussed in week 7-13.</td>
</tr>
<tr>
<td>Style and format</td>
<td>Short answer and essay.</td>
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**Subject Learning Outcomes**
- Prepare and characterise different classes of electromaterials, such as conducting polymers, nanocarbons and electrocatalysts and appreciate how a materials properties change as its dimensions are reduced to the nanoscale.
- Critique the properties of presently used electromaterials and how these can be improved by materials design and modelling.
- Demonstrate an understanding of the origin of photoactive behaviour in materials and the application of key analytical techniques.

| Marking Criteria | The marking criteria will be made available on your eLearning site by week 1 of session. |

**Minimum Requirements for a Pass in this Subject**
To receive a clear pass in this subject a total mark of 50% or more must be achieved. In addition, failure to meet any of the minimum performance requirements is grounds for awarding a Technical Fail (TF) in the subject, even where total marks accumulated are greater than 50%.

The minimum performance requirements for this subject are:
- attempt all assessment tasks
- meet the minimum participation requirements set out below.

**Minimum Student Attendance and Participation**
It is expected that students will allocate 8 hours per week to this subject, including any required class attendance, completion of prescribed readings and assessment tasks.

Student attendance at tutorials, practicals, seminars is compulsory and students must attend at least 70% of classes. Absences will require the submission of an application for Academic Consideration via SOLS and the presentation of suitable documentation, for example a Medical Certificate, to Student Central as soon as practical. For further details about applying for academic consideration visit the Student Central webpage:

**Scaling**
Scaling may occur in this subject at the end of session by the Unit Assessment Committee and/or Faculty Assessment Committee (FAC). Marks will only be scaled to ensure fairness/parity of marking across groups of students. Scaling will not affect any individual student’s rank order within their cohort. For more information refer to Assessment Guidelines – Scaling:

**Late Submission**
Late submission of an assessment task without an approved extension of the deadline is not acceptable. If you are unable to submit an assessment due to extenuating circumstances (e.g. medical grounds or compassionate grounds), you can make an application of academic consideration. Not all circumstances qualify for academic consideration. For further details about applying for academic consideration visit the Student Central webpage:
Late Submission Penalty – at 5%

Late submission of an assessment task without an approved extension of the deadline is not acceptable. Marks will be deducted for late submission at the rate of 5% of the total possible marks for that particular assessment task per day. This means that if a piece of work is marked out of 100, then the late penalty will be 5 marks per day (5% of 100 possible marks per day). The formula for calculating the late penalty is: the total possible marks x 0.05 x number of days late. For the purposes of this policy a weekend (Saturday and Sunday) will be regarded as two days.

For example:

- Student A submits an assignment which is marked out of 100. The assignment is submitted 7 days late. This means that a late penalty of 35 marks will apply (100 x 0.05 x 7). The assignment is marked as per normal out of 100 and is given a mark of 85/100, and then the late penalty is applied. The result is that the student receives a final mark of 50/100 for the assignment (85 (original mark) – 35 marks (late penalty) = 50/100 (final mark)).

- Student B submits a report which is marked out of 20. The report is submitted three days late. This means that a late penalty of 3 marks will apply ((20 x 0.05 x 3). The report is marked as per normal out of 20 and is given a mark of 17/20, and then the late penalty is applied. The result is that the student receives a final mark of 14/20 for the report (17 (original mark) – 3 marks (late penalty) = 14/20 (final mark)).

No marks will be awarded for work submitted either after the assessment has been returned to the students or more than two weeks after the due date, whichever is the sooner. This does not apply to situations where a particular assessment task is undertaken by students at different times throughout the session, but where the assessment is based on experiments or case studies specific to a student. In this case no marks will be awarded for work submitted more than two weeks after the due date.

Notwithstanding this, students must complete all assessment tasks to a satisfactory standard and submit them, regardless of lateness or loss of marks, where submission is a condition of satisfactorily completing the subject.

System of Referencing Used for Written Work

The Royal Society of Chemistry is the preferred referencing system for this subject. Details of this referencing is available at:


Use of Internet Sources

Students are able to use the Internet to access the most current information on relevant topics and information. Internet sources should only be used after careful critical analysis of the currency of the information, the role and standing of the sponsoring institution, reputation and credentials of the author, the clarity of the information and the extent to which the information can be supported or ratified by other authoritative sources.

Plagiarism

The full policy on Academic Integrity and Plagiarism is found in the Policy Directory on the UOW website.

“The University’s Academic Integrity and Plagiarism Policy, Faculty Handbooks and subject guides clearly set out the University’s expectation that students submit only their own original work for assessment and avoid plagiarising the work of others or cheating. Re-using any of your own work (either in part or in full) which you have submitted previously for assessment is not permitted without appropriate acknowledgement. Plagiarism can be detected and has led to students being expelled from the University.
The use by students of any website that provides access to essays or other assessment items (sometimes marketed as ‘resources’), is extremely unwise. Students who provide an assessment item (or provide access to an assessment item) to others, either directly or indirectly (for example by uploading an assessment item to a website) are considered by the university to be intentionally or recklessly helping other students to cheat. This is considered academic misconduct and students place themselves at risk of being expelled from the University."

**Submission of Assessments**

Refer to the submission requirements under the details of the individual assessments. Students should ensure that they receive a receipt acknowledging submission. Students will be required to produce this in the event that an assessment task is considered to be lost. Students are also expected to keep a copy of all their submitted assessments in the event that re-submission is required.

**Assessment Return**

Students will be notified when they can collect or view their marked assessment. In accordance with University Policy marked assessments will usually only be held for 21 days after the declaration of marks for that assessment.
Section C: General Advice

Students should refer to the Faculty of Science, Medicine and Health website for information on policies, learning and support services and other general advice.

University Policies

Students should be familiar with the following University policies:

a. Code of Practice – Teaching and Assessment

b. Code of Practice – Research, where relevant

c. Code of Practice – Honours, where relevant

d. Student Charter

e. Code of Practice – Student Professional Experience, where relevant

f. Academic Integrity and Plagiarism Policy

g. Student Academic Consideration Policy

h. Course Progress Policy

i. Graduate Qualities Policy

j. Academic Complaints Policy (Coursework and Honours Students)

k. Policy and Guidelines on Non-Discriminatory Language Practice and Presentation

l. Workplace Health and Safety, where relevant

m. Intellectual Property Policy

n. IP Student Assessment of Intellectual Property Policy, where relevant

o. Policy on Ethical Objection by Students to the Use of Animal and Animal Products in Coursework Subjects, where relevant

p. Human Research Ethics Guidelines, where relevant

q. Animal Research Guidelines, where relevant
r. Student Conduct Rules and accompanying Procedures or Research Misconduct Policy for research students

Student Support Services and Facilities
Students can access information on student support services and facilities at the following link. This includes information on “Academic Support”, “Starting at University, “Help at University” as well as information and support on “Career’s and Jobs”. http://www.uow.edu.au/student/services/index.html

Student Etiquette
Guidelines on the use of email to contact teaching staff, mobile phone use in class and information on the university guide to eLearning ‘Netiquette’ can be found at http://www.uow.edu.au/student/elearning/netiquette/index.html

Version Control Table

<table>
<thead>
<tr>
<th>Version Control</th>
<th>Release Date</th>
<th>Author/Reviewer</th>
<th>Approved By</th>
<th>Amendment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20151204</td>
<td>A/Prof Attila Mozer – Subject Coordinator</td>
<td>Mrs Sonia Losinno – ADE Nominee</td>
<td>FINAL AIIM902 Autumn 2016 Subject Outline</td>
</tr>
</tbody>
</table>