

3rd International Summer School on “Carbon and related nanomaterials: Synthesis, characterization, properties and applications in Energy”

Cursos Extraordinarios
Universidad Zaragoza

Vicerrectorado de Cultura y Proyección Social

CURSOS
EXTRAORDINARIOS
UNIVERSIDAD DE ZARAGOZA

3rd International Summer School on “Carbon and related nanomaterials: synthesis, characterization, properties and applications in energy”



Jaca (Spain), July 11-15, 2022

Objectives:

This multidisciplinary course offers an introduction into the field of carbon nanomaterials and related systems of great actual interests (e.g. 2D, perovskites, among others). This is a topic of great scientific and technological relevance, especially in what concerns energy related applications.

This course is aimed at students interested in nanoscience and nanotechnology, studies in physics, chemistry or engineering. It offers a broad and comprehensive overview on the mentioned nanomaterials. In a step by step approach it will provide (i) the scientific base to understand the fascinating properties of these materials as well as of experimental and theoretical characterization techniques, (ii) insight into techniques of how to transfer these nanomaterials in the macroscopic scale, and (iii) understanding on their relevance for technological products and applications, with special focus on the field of energy. The topics of the classes include a very systematic description of the nanomaterials, the synthesis methods, their chemistry and functionalization possibilities, the most important characterization techniques, macroscopic assembly approaches and, last but not least, applications in the field of energy (photovoltaics) and sensing technologies.

The overall objective of the course refers to demonstrate the important contribution of carbon nanomaterials and related systems for scientific and technological progress. The participants also should become aware of the need for inter- and multidisciplinary efforts of scientists and technologists in different disciplines to exploit the full potential of these unique nanomaterials. In this way, it will be shown that these nanomaterials represent unique objects to obtain broad scientific and technological knowledge.

Programme:

Monday, 11th of July

19:30. Introduction to carbon nanostructures [11]

Tuesday, 12th of July

09:00. Introduction to 2D Materials [12]

09:30. Graphene oxide [11]

10:00. Other carbon nanomaterials [9]

11:30. Chemistry of Carbon Nanostructures [4]

12:30. TEM studies on carbon and related nanomaterials (structural and compositional analyses) [10]

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19:30. Electronic structure of nanomaterials (Introduction to band-structure theory [3])

Wednesday, 13th of July

09:00. Introduction to Raman spectroscopy of carbon nanostructures [7]

10:00. Theoretical spectroscopy of nanomaterials (optical and vibrational spectroscopy) [3]

11:30. TEM studies on carbon and related nanomaterials (Physical properties investigations) [12]

12:30. Application of Raman spectroscopy to the characterization of carbon nanotubes and graphene [7]

19:30. Carbon nanomaterials for organic and hybrid photovoltaic technologies (I): materials for active layers and electrodes [5]

Thursday, 14th of July

09:00. Carbon nanomaterials for organic and hybrid photovoltaic technologies (II): Devices architecture and impact on power conversion efficiency and stability of the solar cells [5]

10:00. Atomic Force Microscopy. The nanolaboratory on the tip (introduction) [6]

11:30. Carbon nanostructures for energy applications [2]

12:30. Halide Perovskite Solar Cells: From materials to stable and efficient devices [8]

19:30. Dynamic Atomic Force Microscopy: Modelling tip-sample interaction [6]

Friday, 15th of July

09:00. Functional materials based on carbon based nanoparticles [1]

10:00. Carbon nanostructures for sensing applications [2]

11:30. Carbon-based electrodes for Perovskite solar cells [8]

12:30. Layer by Layer assembly of graphene and related materials at the air –water interface [1]

Speakers:

1 Alan Dalton, Professor, Sussex University (Brighton, UK)

2 Alejandro Ansón Casaos, Research Scientist, Instituto de Carboquímica (ICB-CSIC, Zaragoza, Spain)

3 Alejandro Molina Sanchez, RyC Researcher (Universidad de Valencia, Spain)

4 Ana Benito, Senior Research Scientist, Instituto de Carboquímica (ICB-CSIC, Zaragoza, Spain)

5 Antonio Urbina Yeregui, Professor, Politechnical University of Carthage, Spain)

6 Jaime Colchero Paetz, Profesor, University of Murcia (Spain)

7 Matthieu Paillet, Research Scientist, University of Montpellier (France)

8 Monica Lira Cantu, Profesor, Catalan Institute of Nanoscience and Nanotechnology (ICN2, Barcelona, Spain)

9 José Miguel González Domínguez, Research Scientist, Instituto de Carboquímica (ICB-CSIC, Zaragoza, Spain)

10 Simon Hettler, MSCA Postdoc, Instituto de Nanociencia y Materiales de Aragon (INMA), CSIC-Universidad de Zaragoza

11 Wolfgang Maser, Profesor, Instituto de Carboquímica (ICB-CSIC, Zaragoza, Spain)

12 Raul Arenal, ARAID Senior Researcher, Instituto de Nanociencia y Materiales de Aragon (INMA), CSIC-Universidad de Zaragoza

Course Participants:

Students of last year (physics, chemistry, materials, engineering, electronics)

Master students

PhD students

Postdos

Technicians

Researchers

Credit Points

The recognition of credit points 0.5 ECTS by the University is requested.

1. The participants can request the recognition of the realized activity as permanent Training

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2. Recognition as ECTS credit points by the Universities (group G-9). More information at <https://cursoextraordinarios.unizar.es> (Credit Section)
3. ECTS credit points in other Universities
Students interested in the recognition of ECTS credit points of the International Summer Course of the University of Zaragoza, should consult with the corresponding Faculty or School

Evaluation Procedure:

Examination in the form of a test will be realized. A cut-off mark of 5/10 is required to pass the test.

Lodging:

The course takes place at the University Residence of Jaca, C/Universidad 3, 22700 Jaca, Spain (Jaca is a town located in the Pyrenees, about 150 km from Zaragoza. (1.5h by car, 2.5 h by regular coach connection (Avanzabus)).

Information about booking of lodging:

<http://www.unizar.es/resijaca>

Phone: 974 36 01 96

e-mail: resijaca@unizar.es

Date of Event:

July 11-15, 2022

Coordinators:

Raul Arenal (ARAID Ssenior Researcher, Instituto de Nanociencia y Materiales de Aragon (INMA), CSIC-Universidad de Zaragoza).

Wolfgang Maser (Professor, Instituto de Carboquimica (CSIC), Zaragoza)

Lecture hours:

20h

Fee:

130 EUR

Reduced Fee

110 EUR