Study Programme: Master Academic Studies in Chemistry

Course Unit Title: Chemistry of fullerenes

Course Unit Code: IHN-504

Name of Lecturer(s): Full professor Aleksandar Đorđević

Type and Level of Studies: Master of Science Degree

Course Status (compulsory/elective): Elective

Semester (winter/summer): Winter

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated: 6

Prerequisites: None

Course Aims:

To expand the students' views on cluster carbon structures, fullerenes, nanotubes and other carbon nanomaterials. The course lessons cover the most important chemical reactions of fullerenes, especially C 60 , carbon nanotubes, and physico-chemical properties of carbon nanomaterials and nanocomposites. During experiments, students will synthesise and physico-chemically determine covalent fullerene derivates, inclusive complexes, as well as nanocomposites of fullerenes by using state-of-the-art techniques for separation and determination of nanoparticles. One of the main goals is to educate students to successfully search patents and scientific literature, develop critical thinking, set up scientific hypothesis, improve writing skills and present experimental results.

Learning Outcomes:

Students should be able to search scientific literature and patents, recognise fundamental issues concerning chemical properties of fullerenes and other carbon nanomaterials, deal with basic knowledge of result interpretation obtained by state-of-the-art instruments for nanomaterial characterisation.

Syllabus:

Theory

Fullerenes and their properties, chemical reactivity, regiochemistry of multiaddition reactions, nucleophilic reactions, cycloaddition reactions, hydrogenation an halogenation of C 60, radical reactions, fullerene polymers, biologically active derivatives of fullerenes, advances in nanocarbon materials.

Practice

Basic principles of synthesis (synthesis of polybrominated and polyether derivatives of C 60 and inclusive complexes of C 60) and separation of nanoparticles, state-of-the-art techniques applied to determine synthesised derivatives: GEC, TEM, AFM, SEM, DLS and zeta-potential measurements.

Required Reading:

1. Advanced carbon materials and technology, Ashutosh Tiwari & S.K. Shukla (Editors), Chapter 6 Bioimpact of carbon nanomaterials, Djordjevic A., Injac R., Jović D., Mrđanović J., Seke M., 2013, WILEY-Scrivener Publishing, USA;
2. Fullerenes, chemistry and reaction, Hirsch A., Brettreich M., 2005, Wiley-VCH;
3. Carbon nanomaterials, Y. Gogotsi, 2006, Taylor &Francis;
4. Raz Jelinek, Carbon Quantum Dots, Synthesis, Properties and Applications, 2017, Springer;
5. Carlos P. Bergmann, Fernando Machado (Editors), Carbon Nanomaterials as Adsorbents for Environmental and Biological Applications, 2017, Springer.

Weekly Contact Hours:	**Lectures:** 3(45)	**Practical work:** 2(30)

Teaching Methods:

Lectures, laboratory work, seminar(s)

Knowledge Assessment (maximum of 100 points): 100

Pre-exam obligations	points	**Final exam**	points

Active class participation	5	written exam	25
Practical work	20	oral exam	20
Seminar(s)	30		