



**Centre  
for Polar  
Studies**

Centre for Polar Studies  
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**Reference No: CSP/2019/US/1**

**Title of PhD project: The influence of UV radiation in the Spitsbergen region on the structure and properties of biopolymers present in the skin**

**Leading unit:** International Environmental Doctoral School associated with the Centre for Polar Studies at the University of Silesia in Katowice (IEDS)

**Deadline:** 31<sup>th</sup> August 2019

**Entrance Exam:** 2–3<sup>rd</sup> September 2019; In the case of students from abroad the exam will be performed online. [in the form of teleconference]

**Interviews:** 4<sup>th</sup>–13<sup>th</sup> September 2019, venue will be indicated later. In the case of students from abroad the exam will be performed in the form of teleconference.

**Mode of study:** full-time

**Degree to be obtained:** PhD in engineering and technical sciences in the discipline: Material engineering

**Duration:** 4 years (8 semesters), from October 2019

**Language:** English

**Scholarship:** approx. 550€ monthly (1–2<sup>nd</sup> year); approx. 850€ monthly (3–4<sup>th</sup> year)

**Required documents and registration online:**

Requirements and regulations: <https://www.mssd.us.edu.pl/en/candidate-of-ieds/>

Registration: [www.irk.us.edu.pl](http://www.irk.us.edu.pl)

**Conditions of recruitment:**

I STAGE: Knowledge test (entrance test) in the field of discipline. The test is scored on points: from 0 to 10 points.

A positive result of the test is that the candidate gets a minimum of 7 points. Absence on the test disqualifies the candidate from the entire qualification procedure.

II STAGE: a) the final result of the candidate's completion of higher education (maximum 6 points, diploma grading ratio: 6.0 (excellent) – 6 points, 5.0 – 5 points, 4.5 – 4 points, 4.0 – 3



points. 3.5 – 2 points, 3.0 – 1 point), b) for candidates (students) referred to art. 186 para. 2 of the Act – a certificate of average grade from at least three years of uniform Master's studies, rounded to one decimal place, according to the conversion factor: 6.0 (excellent) – 6 points; 5.0 – 5 points; 4.5 – 4 points; 4.0 – 3 points; 3.5 – 2 points; 3.0 – 1 point);

III STAGE: Interview for assessing: the candidate's intellectual level, knowledge of English, substantive level of the doctoral dissertation project, motivations and predispositions for scientific work, scientific achievements to date of the candidate (maximum 15 points).

**Requirements:**

1. MSc degree (or equivalent) in Material engineering, Biomedical engineering, Chemistry, Physics, Biology or related fields. It is allowed to submit applications by candidates who finish their studies in the coming months and submit the opinion of the master's thesis supervisor on its advancement status and the obligation to submit a master's degree by 13 September 2019.
2. Knowledge of research topics related to: (i) the impact of external factors, especially UV radiation, on tissues, (ii) the impact of biological environment on biomaterials, (iii) biomaterials surface engineering, (iv) biopolymers and (v) biomaterial degradation processes.
3. Knowledge of issues related to the methods of manufacturing basic engineering materials used in medicine and typical tools and methods used in *in vitro* and *in vivo* studies of biomaterials.
4. Knowledge of English that allows communication, reading and writing of scientific papers.

**Tasks description:**

1. Development of a method of producing thin layers of biopolymers present in the skin on the porous surface of titanium.
2. Characteristics of the structure and properties of biopolymers produced and substrate.
3. Preparation, organization and conduct of research on the influence of UV radiation in the Spitsbergen region on the degradation process of biopolymers produced and analysis of the acquired data.
4. Preparation of patent applications, scientific articles and conference presentations.
5. Regular reporting of work progress.



6. Help in the day-to-day work of the Institute of Materials Science in the University of Silesia in Katowice including organization of research, teaching and co-responsibility for the research equipment.

### Abstract

Climate changes are one of the greatest threats to the world, and it is these that can offset the progress that has been made in medicine and health care in the last half-century thanks to the flourishing of science. The anthropogenic destruction of the ozone layer in the Earth's stratosphere leads to an increase in the amount of solar ultraviolet (UV) radiation reaching the Earth's surface, which in turn can cause negative health consequences in the future, mainly affecting the skin. Uncontrolled exposure to the Sun can cause irreversible changes in the skin, accelerate the aging of the skin and even contribute to cancerous changes. The aim of the project is the innovative application of the impedance spectroscopy method, currently being developed in the world, to quantify the degradation process of biopolymers present in the skin, under the influence of UV radiation in the Spitsbergen region. The PhD student's tasks will include: (i) modifying the surface of titanium using anodic plasma electrochemical oxidation to produce porous oxide layers with increased biocompatibility, (ii) producing thin layers of biopolymers present in the skin on a surface-modified titanium substrate, (iii) characterizing the structure and properties of produced biopolymer layers before and after exposure to UV radiation, and (iv) determining the influence of UV radiation on the mechanism and kinetics of the degradation process of produced biopolymer layers under *in vitro* conditions.

### Other information:

1. The supervisor will be dr hab. Aneta Hanc-Kuczkowska, e-mail: [aneta.hanc@us.edu.pl](mailto:aneta.hanc@us.edu.pl), Institute of Materials Science, Faculty of Computer Science and Materials Science, University of Silesia in Katowice, 75 Pułku Piechoty 1A, 41-500 Chorzów, Poland
2. Contact to Secretary of the IEDS: dr Michał Cieplý, [polarknow@us.edu.pl](mailto:polarknow@us.edu.pl), [www.mssd.us.edu.pl](http://www.mssd.us.edu.pl)