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**Report on the visit of prof. Alexander Kuhn  
[WP3]**

**Level of dissemination: PUBLIC**

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## INTRODUCTION

The visit of Prof. Alexander Kuhn at the Institute of Physical Chemistry of the Polish Academy of Sciences (IPC) was held under a series of cyclical lectures on interdisciplinary emerging research.



Prof. Alexander Kuhn is a full Professor at Ecole Nationale Supérieure de Chimie, de Biologie et de Physique, University Bordeaux, France. He received his PhD in 1994 from the University of Bordeaux. After postdoctoral fellowship at California Institute of Technology, he took up a position of an assistant and afterwards - a full professor position at the École Nationale Supérieure de Chimie et de Physique de Bordeaux (ENSCBP) at the University of Bordeaux.

His research focuses on the modified electrodes with a special focus on applications in electroanalysis, bioelectrochemistry and electrocatalysis.

Prof. Alexander Kuhn is a winner of an ERC Advanced Grant awarded by the European Research Council (ERC) in 2017 for the project: "Electrochemically induced Asymmetry: from materials to molecules and back" (ELECTRA).

## THE COURSE OF THE VISIT

The visit of prof. Alexander Kuhn took place on 12 – 13, November, 2019. On the second day prof. Kuhn delivered a seminar entitled "*Unusual approaches for symmetry breaking in chemical systems*". The seminar was held at the assembly hall of IPC. All researchers and PhD students employed at IPC were invited to participate in this seminar.

### Abstract of the seminar

Asymmetry is a very common feature of many systems, objects and molecules that we encounter and use in our daily life [1]. Actually, it is in a majority of cases the absolutely crucial ingredient for conferring a certain useful property to a system, a prominent example being the chiral nature of pharmaceutically active compounds. Chemists have developed various approaches to generate asymmetry, from the molecular to the macroscopic scale, but are still facing major challenges when exploring efficient alternative physico-chemical concepts for symmetry breaking [2,3]. Therefore, there is a strong need to explore, understand and optimize alternative approaches, which might lead in the long run to completely different but practically viable processes with economic potential. We we'll discuss in this presentation two quite unconventional concepts, allowing to break the symmetry in chemical systems at different scales, ranging from the molecular level to the macroscopic world. The utility of these concepts will be illustrated with a

selection of very recent results concerning the detection, separation and synthesis of chiral molecules [4-7], as well as the elaboration and characterization of asymmetric, so-called Janus objects and systems with complex composition, behavior or functionality [8-15], based on the use of bipolar electrochemistry as a leading strategy [15].

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The seminar of prof. Aleksander Kuhn, assembly hall, the 13<sup>th</sup> November, 2019.

During the first day of his visit and after the seminar, prof. Aleksander Kuhn visited selected laboratories. The aim of these visits was to familiarize prof. Kuhn with IPC, establish contact with synergic groups supporting the ERA Chair holder, and discuss possibility of the future cooperation. Prof. Kuhn was also asked to assess the research conducted in individual groups and to identify possible problems.

Meetings with the following researchers were organized:

- **Dr Piyush Sindhu Sharma** – Functional Polymers Group (head)
- **Dr Maciej Cieplak** – Functional Polymers Group
- **Dr hab. Martin Jönsson-Niedziółka** – Charge Transfer Processes in Hydrodynamic Systems Group (head)
- **Dr Wojciech Nogala** – Nanoelectrochemistry Group (head).

Professor Kuhn was impressed by the quality of the interdisciplinary research in the field of analytical chemistry, biofunctionalized nanoparticles, electrochemistry and nanostructured electrodes conducted at IPC. He also assessed positively IPC capacities in terms of linking different fields of science under a single institution. During the meetings professor Kuhn stressed that the interest and adventure are the driving forces of scientific research. In his opinion setting scientific research goals especially by students is crucial to develop their personal career and scientific work. Professors encouraged visited students to communicate and share their experiences in the international environment. Professor invited one of the PhD student for an internship to his group. Methods of 3D structuring of conductive molecularly imprinted polymers will be investigated during this internship.