Nowadays, the catalysis fulfils a crucial role in the industry, where catalyst mediates in chemical reactions, such as synthesis of ammonia, sulfuric acid, or nitric acid, which are often utilized for fertilizers production. Moreover, facing the present-day climatic problems, the catalyst is utilized for carbon dioxide reduction, therefore reducing the greenhouse effect – the main reason for climate warming. Another problem, which can be solved by catalysis, is depletion of fossil fuels (such as oil). In transport, the industry is trying to use alternative energy sources, more often utilizing electric vehicles, where the role of fuel fulfils hydrogen, which in the combustion process, despite the energy, produces steam. Hydrogen fuel is possible to achieve via catalytic water splitting, wherefrom two water particles, two particles of hydrogen and one particle of oxygen are obtained. However, despite all assets, commercial catalysts are expensive (made from expensive metals) and are consumed very fast. The scientists, trying to improve the catalysts, have designed those, which are based on prevalent metals. Nevertheless, catalyst based on non-commercial elements, suffer low reaction yield and low durability, therefore, the solution which assumes the design of highly advanced nanostructures. Such nanostructures enable reaction yield maximization, a significant limitation of metals quantity required for catalysis and improvement of stability, which prolongs the catalyst lifetime. To further improve the solutions for current catalytic problems, in this project the advanced nanostructures will be designed, where the role of the catalyst for electrochemical water splitting will be fulfilling single atoms of the catalyst. Such structures will enable to maximize the utilization of catalytic active sites, significantly reducing the number of required metals, and preserving the reactions efficiency (or even improving it) in comparison to the commercial catalyst. Furthermore, single-atom catalysts are detailed described, therefore this project will enable to better understand the properties of the materials and reactions mechanisms, therefore broaden the prevailing knowledge conducted with catalysis. Beneath, the graphical representation of how the amount and architecture of the catalyst impact on the structure, from the commercial mesh by nanoparticles finishing on single atoms.