Pseudomonas aeruginosa is a bacterium mainly associated with nosocomial infections, which are difficult to treat due to the growing antibiotic resistance of the microorganisms. However, it is also a well-known producer of various substances useful in many industries. They include e.g. biopolymers, surfactants, and pigments. The most studied example of a pigment is pyocyanin. This substance has the potential to be used in areas such as medicine (anti-cancer therapy), agriculture (protection of plants against pathogens), environmental protection (removal of soil contamination), phage therapy, production of OLED screens, and colorimetric indicators or energy production in microbiological fuel cells. In recent years, intensive research has been conducted on the influence of various stress factors on the production of different bioproducts. Nanomaterials or electromagnetic fields are stressors mentioned among these factors.

This project aims to investigate how nanomaterials, electromagnetic fields, and a combination of these factors influence the production of pyocyanin by *P. aeruginosa*. In the course of the research, it is planned to use mathematical methods to design experiments to find out which stressors significantly increase or decrease the amount of the obtained pigment. Carrying out these stages of research will allow determining the optimal process conditions for the production of pyocyanin. Microbiological and biochemical methods (chromatography) will be used, which will enable the assessment of cell growth and viability and the quantitative and qualitative assessment of the obtained pigment. In addition, analyzes have been planned that will lead to an understanding of the interaction between the bacteria and the stressor used. The applied methods will include flow cytometry (e.g. oxidative stress testing), epifluorescence phase-contrast microscopy (observations of cell viability and mobility), electron microscopy (assessment of cell morphology), and genetic assays (assessment of gene expression and genome sequencing). The project will be implemented in international cooperation with Ecole Nationale Supérieure de Chimie de Rennes in France and Technische Universitaet in Berlin.

The planned research will provide a significant amount of data on the influence of nanomaterials and electromagnetic fields on the production of pyocyanin by *P. aeruginosa*. Moreover, they will provide information on optimal process conditions that will lead to the highest yield of the pigment. Project outcomes will result in an understanding of the effects of stressors on pyocyanin production and could provide insight into potential ways to modulate the production of other bioproducts.