Main aim of the project is to determine the effect of density of direct electric current depending on the dose and type of available organic substrate on the amount and quality of excess sludge produced during treatment of leachate from the soilless tomato cultivation in the bio-electrochemical sequencing batch biofilm reactor (SBBR -Sequencing Biofilm Batch Reactor).

The project proposes qualitative and quantitative characterization of sludge generated in the electro-biological sequential biofilm batch reactor (SBBR) that purifies wastewater from the soilless tomato cultivation under the flow of direct electric current.

The study aims to determine the impact of density of electric current and dose and type of external carbon source on the microbial community in biofilm, quantity and quality of the excess sludge formed during the purification processes of heterotrophic and hydrogenotrophic denitrification and electrocoagulation.

This topic was brought up because nowadays greenhouse cultivations carried out in the open system constitute an ever greater threat to the natural environment in Poland and in the world. Cultivation of plants carried out in an open system is characterized by production of wastewater with high concentration of pollutants that is discharged into the soil in an uncontrolled way. Irrigation and nutrition in the soilless cultivation is carried out with hydroponic fertilizer solution. The medium after passing through the soilless cultivation is more concentrated than freshly made. This is an effect caused by greater transpiration of water than nutrients by plants. The lowering of negative effect of medium concentration is possible by using of overflow, i.e. an additional amount of medium. In the case of tomatoes cultivation, the overflow might constituted up to 50%. The literature data showed that in greenhouse wastewater the concentration of nitrate nitrogen might be up to 466 mg N/dm^3, while the concentration of total phosphorus might be up to 370 mg P/dm^3. It is worth noting that in the cultivation conducted for a period of 6 months, the cultivation of tomatoes on mineral wool consumes 10,220 m^3/ha of nutrient solution, while the amount of the overflow is 3082 m^3/ha. During this period 4.7 t of nutrients were discharged into the 1 ha of soil, and 1000 kg of which constituted nitrogen.

In the light of the existing regulations on wastewater quality, which should be met prior to discharge into the environment, wastewater from the soilless culture should be treated before being introduced into the environment.

The described in the project results suggest that using external carbon source and electric current ensure effective greenhouse wastewater treatment from biogenic compounds, moreover the excess sludge produced during treatment will be characterized by high quality and quantity.

In the proposed project, the most attention is paid to the characteristics of the excess sludge formed during bio-electrochemical processes under influence of direct current.

These studies can then be used to design a system that would effectively treat wastewater from the soilless cultivation, and produce the excess sludge that, without using complicated stabilization processes, will be used, as a fertilizer in field crops. The study assumes that by using the appropriate dose of an external carbon source for removal of nitrates in denitrification, the produced excess sludge will be characterized by low amount of organic carbon and thus will not require complicated stabilization processes. In addition, the study will solve the problem of environmental pollution caused by greenhouse wastewater. This aim will be achieved by treatment of leachate in the bio-electrochemical sequencing batch biofilm reactor. Moreover, the research could be used for treatment of other wastewater characterized by a low COD/N ratio.

The obtained research results will determine the influence of density of electric current, dose and type of organic carbon on the microbial community in biofilm in the bio-electrochemical SBBR with direct current flow. Moreover, the study will determine the influence of organic substrate and density of direct electric current on amount and quality of the excess sludge produced during treatment. The result of the study will be assessment of their management.