Summary

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REMOVING HYDROCARBONS USING BACTERIA ISOLATED FROM CONTAMINATED AREAS

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Areas contaminated with hydrocarbons, which include the areas excluded from the operation of the old gasworks, are a source of obtaining bacteria whose metabolism is designed to biodegradable aliphatic and aromatic hydrocarbons, including PAH. Isolated bacterial strains are used to land reclamation in degraded areas as well as wastewater treatment and groundwater contaminated with hydrocarbons.

The goal of the carried out studies was to identify the genotype of selected bacterial strains with enhanced ability to remove hydrocarbons from the microorganisms collection of the Department of Biology and Ecology (Wroclaw University of Technology) using research methods of molecular biology and confirmation of hypothesis, that bacteria with improved ability to remove hydrocarbons belong to a limited number of bacteria present in the environment. Studies have shown that bacterial strains isolated from contaminated soil and able to degrade hydrocarbons belong to the *Pseudomonas*, *Stenotrophomonas* and *Rhodococcus* genus, the types most commonly identified in the previously conducted experiments in the world.

The study confirmed the suitability of measuring the absorbance at 600 nm during batch culture of bacteria to determine the constant rate of increase in the size (biomass) of bacteria.

It was shown that the respiration test allows to identifying the parameters necessary to describe the kinetics of degradation the hydrocarbons by the adapted bacterial strains, including the time to adapt to new substrates.

The aim of utilitarian studies was to determine the conditions which must be met for coming from soil contaminated by hydrocarbons strains of bacteria, which can be applied in systems technology for wastewater treatment for elevated concentrations of hydrocarbons.

It was found that the solid growth rate of the tested bacteria with an increased ability to remove hydrocarbons take values ranging from 0.1401 to 0.2460 day^{-1} and were less than the maximum growth rate of nitrifying bacteria falling within the range of 0.6 to 0.8 day^{-1}. Knowing the problems with maintaining the biomass of nitrifying bacteria in activated sludge at municipal wastewater treatment plants it can be concluded that it is not possible to use bacterial cultures with enhanced ability to remove hydrocarbons in activated sludge systems, where a high load of easily biodegradable compounds is in the wastes.

It has been shown that bacterial cultures with enhanced ability to remove hydrocarbons can be used for sewage treatment of industrial wastewater contaminated by aliphatic and aromatic hydrocarbons, provided their adaptation to a stable composition of wastewater. In case of changing the substrate, the time of adapt for the metabolism of these bacteria to the new

conditions can be up to a few days. Minimum sludge age on the sewage treatment plants should be from 50 to 100 days and this due to the low values of the rate constants for bacterial growth.

The study showed that after adding the bacterial inoculum to the activated sludge microfauna occur as a result of predation, what can to reduce the population of bacteria introduced as the inoculum. This mechanism acts on the kinetics of incorporation of microorganisms with enhanced biodegradation of hydrocarbons in the structure of the activated sludge flocs and, consequently, can contribute not to reach the intended technical effect.

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