Summary of doctoral dissertation

Title: **Microbiological degradation kinetics of selected volatile organic compounds**

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The study, which is the subject of the doctoral dissertation, was the first phase of work related with development of air purification technology for selected volatile organic compounds in the trickle-bed bioreactor (TBB).

The impact of volatile organic compounds (VOCs) on the environment and the properties of selected pollutants i.e. vinyl acetate and styrene, are described in the first chapters. The choice of these compounds was based on the vast scale of their production and the diversity of the chemical structure of both substances, which undoubtedly affects their biological decomposition. The soil sampling was performed in the area of plant using these compounds and several strains of bacteria decomposing vinyl acetate were isolated, but unfortunately none decomposing styrene. Selection of vinyl acetate-degrading microorganisms (*Pseudomonas* sp. EC3_2001, *Pseudomonas fluorescens* PCM 2123) and styrene-degrading one (*Pseudomonas* sp. E-93486) and the results of tests related to determine the most favorable conditions for their growth are presented in chapter 4. Creating the optimal environment for microorganisms can accelerate processes that occur spontaneously in nature, but more slowly and less efficiently.

Chapters 5 and 6 - the main part of this work- are dedicated to research conducted in batch or continuous reactor. In the absence of literature data regarding kinetics of vinyl acetate biodegradation, it was necessary to designate the form and parameters of equation describing the rate of its biodegradation by selected microorganisms and to determine the basic metabolic parameters. For the second pollution, studies confirmed the earlier suggestions about an inhibitory effect of styrene. Available relationships, describing this type of microbial growth, approximate the experimental data with the average relative error e_y, no more than a few percent.

In addition, for the strain Pseudomonas sp.E-93486 using styrene as a source of carbon and energy, the values of the parameters Arrhenius equation were found.

Kinetic models, elaborated in this work, were verified using experimental curves for biomass growth and substrate utilization. Rewarding compatibility of experimental and computable data was obtained.

Results of this study were also used to write stoichiometric equations describing the process of substrate (VOCs) utilization and biomass formation. Knowledge of chemical equations allows to control the process in a trickle bed bioreactor, for example by nitrogen supplementation.