

PURIFICATION OF TOXIC LEACHATE BY METHANOGENIC MICROORGANISMS

Shabliy O¹, Hovorukha V², Tashyrev O².

¹National Technical University of Ukraine Igor Sikorsky Kyiv Polytechnic Institute

²D.K. Zabolotny Institute of Microbiology and Virology of the NAS of Ukraine,

Department of extremophilic microorganism's biology

e-mail: alexandra.shably@gmail.com

The problem of accumulation of liquid organic waste is urgent for countries of all over the world. Toxic leachate is formed in municipal landfills as a result of microbial fermentation of solid organic waste. It has caused catastrophic pollution of groundwater and natural ecosystems. The leachate contains toxic soluble organic acids and alcohols in high concentrations. Currently, there are no effective technologies for liquid organic waste purification. The application of microbial technologies is a promising method for solving this environmental problem.

The aim of the work was to determine the effectiveness of the leachate purification by metanogenic microorganisms.

The anaerobic bioreactor (50 L) was used for leachate purification. Fermented methane tank sludge was used as inoculum. The concentration of soluble organic substances was determined by the permanganate method. Determination of pH and Eh was performed using an ionometer universal EZODO MP-103. Gas holders connected to methane tank were used to determine the volume of gas. The composition of the gas phase was determined by standard methods on a gas chromatograph.

Effective purification of the leachate by methanogenic microorganisms was shown. The concentration of soluble organic compounds decreased from 280 to 20.8 mg/L during 56 days of fermentation. However, the concentration of organic compounds increased from 208 mg/L to 520 mg/L on 33 days of fermentation. This indicated the hydrolysis of unfermented food waste particles by diversified microbial community of methane tank sludge. The concentration of CH₄ in the gas phase of the anaerobic bioreactor increased and ranged from 40% to 72% (from 12 to 56 days).

Thus, the high efficiency of toxic filtrate purification indicates the possibility of using methanogens for the development of environmental biotechnologies for filtrate purification in landfills with the simultaneous obtaining of high-energy fuel – biomethane.