PRODUCTION OF BIOGAS FROM WASTE WATERS USING PURE CULTURES FROM THE STRAIN *Methanosarcinabarkeri*

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Abstract

In 2006-2007 a global transformation of organic substances and influent the wastewater collection system of the Ohrid Lake was studied. The transformation takes place in anaerobicpartthrough biosynthesis of the biomass of micro-organisms. Reductionof the quantities of certain elements (C, N_2, P_2O_5, etc.) in the influent is in gaseous state through the process of biomethanization and desulfofication.

Quantities of total sulphate at the end was 2, and with the application of zimogenite strains or mixed metanogenic cultures (Methanosarcinabarkeri) were cut 28 times and 18% of biodegraded carbon is in form of biogas, which contains averagely between 50 and 90 vol. % methane.

Key words' Wastewatermetanogenibacteria, biogas-

INTRODUCTION

Waste silt which is produced by processing of waste waters is accumulated in dry fields and is used for biogas-methane production [1].

Determination of biomass has a great significance in the microbic ecology because of the micro-organisms which represent a basis for the whole cycle of biogas-methane production (1.4).

Dissolving of the municipal solid wastes to methane is a process done by micro-organisms' help and require coordinative activity of certain groups of bacteria. One of those groups of micro-organisms is *Methanosarcinabarkeri*which involves 4 types of bacteria. The methane production is done by application of raw cultures which dissolve the biological polymers as cellulose, hemi-cellulose and proteins. (1.2)

MATERIAL AND METHODS OF WORK

Waste waters from the commutator system from the Ohrid Lake, waste silt from the commutator system and raw cultures of methanogenic bacteria are used for the examination. The examinations are done during the period from 2006 to 2007 in May, July and September. The process of methanogenesys is followed during the bio-dissolvingprocess. Basic

element which transforms during the process is carbon. During the growing of the methanigenic bacteria, acetate (CH_3COO) and the methyl group (CH_3), transform into methane (CH_4), and the carbonic group (COOH) in carbon dioxide (CO_2). Production of the methane is from biological polymers as cellulose, hemi-cellulose and proteins. First in the row of reactions is the hydrolysis by which oligomers and monomers (maltose, glucose, peptides, and amino-acids) are produced.

Technological procedure of the anaerobic fermentation is done by help of the laboratory “ANAMET“(second generation reactor,Colleran and Co 1982), from the producers introduction. (1)

Barker foil (1956) which is used for control of the anaerobic fermentation contains:(Na-acetate,NH_4Cl,Na–tio-gluconate,$MgSO_4$, K_2HPO_4,NaCl,an extract from mash, distilled water).

PHin the foil is 7.4.

The extract from mash is produced by boiling of barley in distilled water of 100g/l, in an hour time, and then is filtrated.

The waste silt form the commutator system is the basic substrate used in the examinations.

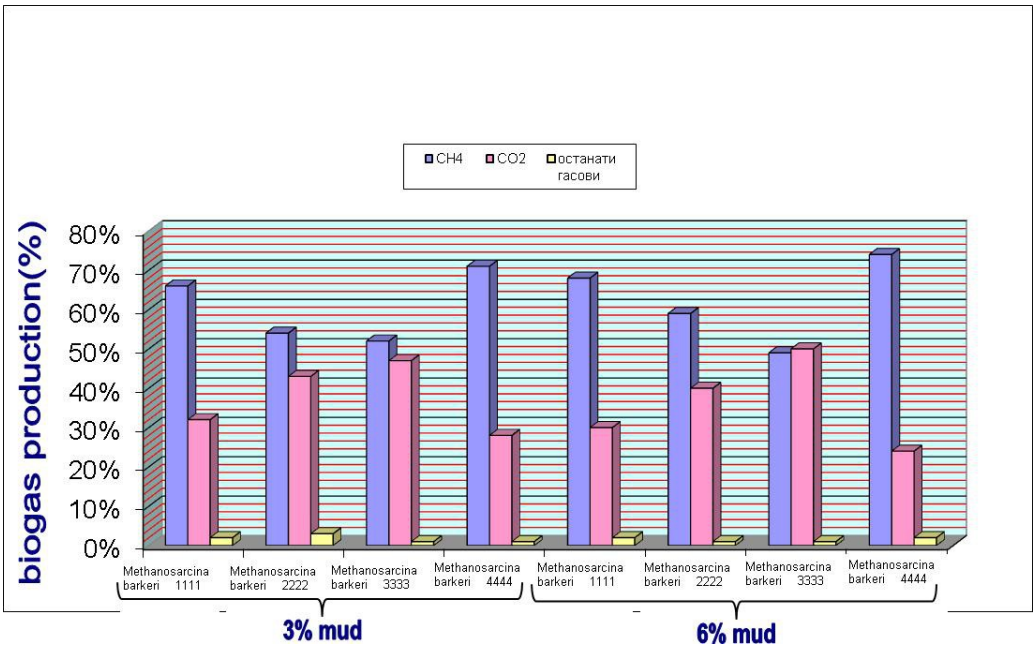
Biogas production is examined with variable values of the organic material (substrat) and temperature at which methane and carbon dioxide are produced.

Changes of the substrate concentration are:3% and6% and the temperatures are from 33and 37°C.

Used raw methanogenic bacteria are processed on temperature of 33 and 37°C. 4 layers of pureMetanosarcinabarkeribacteria(1,2,3) are used.

RESULTS WITH DISCUSSION

Used raw cultures of methanogenic bacteria are processed on temperature of 33 and 37°C. 4 layers of pure Metanosarcina barkeri bacteria (1,2,3) are used and presented in the following graph 1.



Graph1. Biogas (methane) production by production of raw cultures at temperature of 33°C

If the results of the examination of the role of the methanogenic raw cultures are analysed it is evident that the raw cultures can produce biogas (methane) from the silt which represents the final product during the purification of the waste waters in the commutator system “Ohrid Lake”. (2)

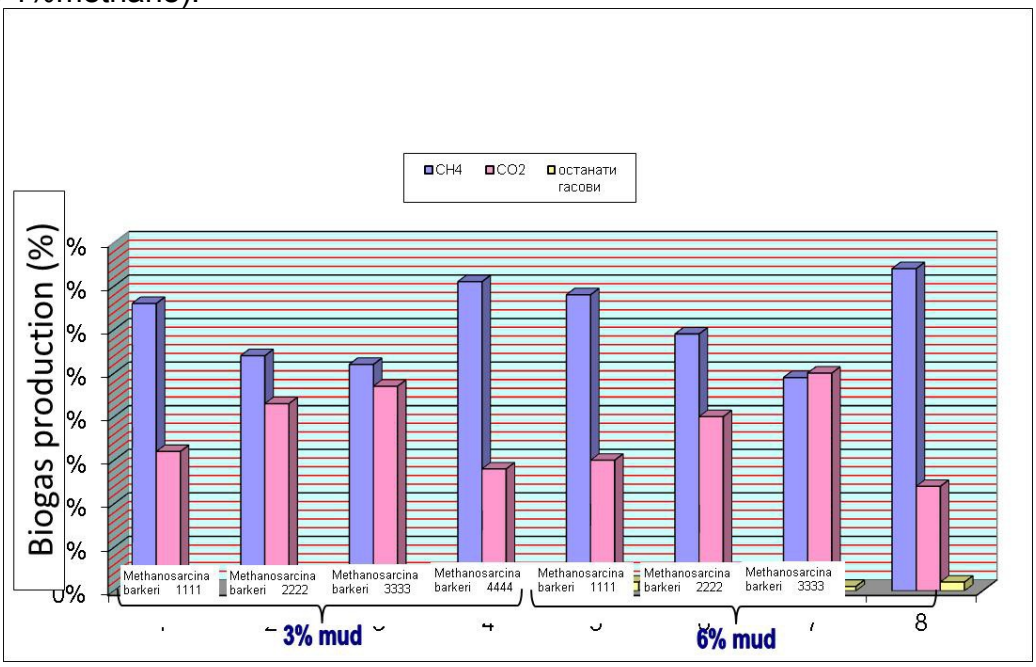
Graph1 shows that raw cultures of methanogenic bacteria produce biogas with 3% silt in the mass at temperature of 33°C. But the largest quantity of biogas at the temperature of 33°Cis produced by *Metanosarcinabarkeri* 4444 (about 71%).

The examined layers of methanogenic bacteria also give good proportion between CH_4 and CO_2, which is positive thing.

At temperature of 33°C the proportion is lowest CH_4:CO_2at Metanosarcinabarkeri 3333,52%:42% with 3% silt and 49%:50% with 6% silt, and Metanosarcinabarkeri 4444 has the highest proportion which is 71%:28% with 3% siltand 74%:24% with 6% silt.

Graph2 represents the results from the production of biogas (methane) at 37°C temperature. They have similar dynamic as those at 33°C temperature. But, here at 37°C temperature the values are different. Here the lowest % of biogas (methane) has Metanosarcinabarkeri 3333 with 3% and 6% silt, and the highest % of biogas (methane) has

Metanosarcinabarkeri 4444, with 3% silt (71% methane) and with 6% silt (74%methane).



Graph2. Biogas (methane) production by production of raw cultures at temperature of 33°C

According the proportion of CH_4:CO_2 here also the lowest proportion has Metanosarcinabarkeri 3333 (51%:48%) with 3% silt and (50,5% :49%) with 6% silt, and highest at Metanosarcinabarkeri 4444 (72%:27%) with 3% silt and (76%:22%) with 6% silt. Graph shows that at temperature of 33°C bigger production of methane is when the types are in 6% of silt. Metanosarcinabarkerico 74% has especially big production with 6% silt and 71% with 3% silt.

Same type produces more biogas at temperature of 37°C so at this temperature Metanosarcinabarkeri 4444 with 6% silt produces 76% methane, and with 3% silt 72% methane.

The proportion of CH4:CO2 can be noticed in graph 2 with the broadest proportion at Metanosarcinabarkeri 4444, and narrowest at Metanosarcinabarkerii 3333.

Conclusion:

1. Methaniogenic raw cultures produce biogas (methane) from the silt which represents final product during the purification of the waste water from the commutator system “Ohrid Lake”.

2. All raw cultures produce biogas with 3% silt and at the temperature of 33°C.

3. Biggest percentage of biogas (methane) has Metanosarcinabarkeri 4444 with 3% silt and 6 % silt at temperature of 33°C.

4. The lowest percentage of biogas (methane) has Metanosarcinabarkeri 3333 with 3% silt and with 6% silt at temperature of 33°C.

5. Highest percentage of biogas (methane) at temperature of 37C with 3% and 6 % silt has Metanosarcinabarkeri 4444.

6. The smallest percentage of biogas (methane) is produced by Metanosarcinabarkeri 3333 with 3% and 6% of silt and 37C temperature.

7. The examined layers of methanogenic bacteria give good proportion between CH_4:CO_2, which is positive thing.

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