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CHEMISTRY TOWARDS AN INFINITE ENVIRONMENT

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Investigation of Natural Biodegradation of Contaminated Environmental Samples Near Heating Plant

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Heating power plant Novi Beograd (Serbia) is the oldest heating plant in Belgrade, with annual consumption of 350 million cubic meters of natural gas. However, beside natural gas, the plant is using app. 45.000 tons of heavy fuel oil app. 3.200 tons of coal [1]. Being located in densely populated areas and near Sava River, heating plant is one of the significant sources of environmental pollution. Presence of different oil pollutants in the sediments and soils of Sava River has already been confirmed [2].

Oil pollutants are complex mixtures of varying composition containing thousands of hydrocarbons each with their own physicochemical properties and degradation kinetics. Biodegradation tests are often performed at high concentrations of individual test substances, whereas environmental biodegradation is taking place at lower concentrations with many chemicals present in a mixture.

In this study we reported natural degradation of oil pollutants in environmental area of heating plant.

O₂ consumption and CO₂ production in period of 68h in soil and water samples from location area of heating plant New Belgrade were measured by using a Columbus Micro-Oxymax respirometer. Total petroleum hydrocarbons was gravimetrically determined before and after respiration experiment. Cells in soil sample consumed 11.52 mL of O₂ within 68 h. By contrast cells in water sample

consumed only 3.61 mL of O₂. The production of CO₂ by soil sample cells was twofold higher than that by water soil cells within 68 h.

Notably, cells in soil sample obtained maximum rate of O₂ consumption after 15 h (4.002 μL/min) while water sample cells obtained maximum rate after 27 h (2.033 μL/min).

Total decrease of TPH at the end of respiration experiment was 87.1 %, and 69.2 % for soil and water sample, respectively.

These results indicate that microbial population in soil is more capable for biodegradation of oil pollutants from this area, and we could suggest that these microorganisms should be used in augmentation approach for bioremediation technology of this contaminated site.

Acknowledgements

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References

- [1] http://www.beoelektrane.rs/basic_information.html
- [2] S. Miletić, M. Ilić, J. Avdalović, T. Šolević Knudsen, V.P. Beškoski, B. Branimir Jovančičević, M.M. Vrvic, EMEC16 - 16th European Meeting on Environmental Chemistry, Torino, Italy, 2015.

Investigation of natural biodegradation of contaminated environmental samples near heating plant

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INTRODUCTION

Heating power plant Novi Beograd - NPPNB (Serbia) is the oldest heating plant in Belgrade, with annual consumption of 350 million cubic meters of natural gas. However, beside natural gas, the plant is using app. 45.000 tons of heavy fuel oil app. 3.200 tons of coal [1]. Being located in densely populated areas and near Sava River, heating plant is one of the significant sources of environmental pollution. Presence of different oil pollutants in the sediments and soils of Sava River has already been confirmed [2].

Oil pollutants are complex mixtures of varying composition containing thousands of hydrocarbons each with their own physicochemical properties and degradation kinetics. Biodegradation tests are often performed at high concentrations of individual test substances, whereas environmental biodegradation is taking place at lower concentrations with many chemicals present in a mixture.

In this study we reported natural degradation of oil pollutants in environmental area of heating plant.

MATERIALS & METHODS

Sampling: Soil and water sample has been taken from contaminated area of NPPNB.

Experiment set up: 1g of soil sample in 100 ml of mineral medium, 100 ml of water sample, both in 500 mL flasks.

O₂ consumption and CO₂ production in period of 68h in soil and water samples from location area of heating plant New Belgrade were measured by using a Columbus Micro-Oxymax respirometer. Total petroleum hydrocarbons was gravimetrically determined before and after respiration experiment.

CONCLUSIONS

These results indicate that microbial population in soil is more capable for biodegradation of oil pollutants from this area, and we could suggest that these microorganisms should be used in augmentation approach for bioremediation technology of this contaminated site.

References

[1] http://www.beoelektrane.rs/basic_information.html

[2] Miletić S., Ilić M., Avdalović J., Šolević Knudsen T., Beškoski V.P., Branimir Jovančićević B., Vrvic M.M., EMEC16 - 16th European Meeting on Environmental Chemistry, Torino, Italy, 2015.

RESULTS & DISCUSSION

Cells in soil sample consumed 11.52 mL of O₂ within 68 h. By contrast cells in water sample consumed only 3.61 mL of O₂. The production of CO₂ by soil sample cells was twofold higher than that by water soil cells within 68 h (Fig 1a, 1b).

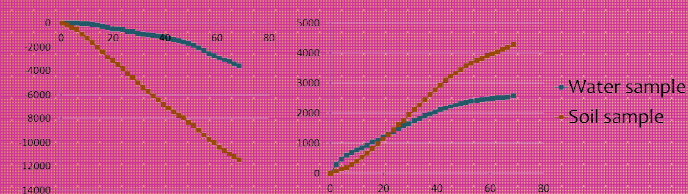


Figure 1: a) O₂ consumption; b) CO₂ production

Notably, cells in soil sample obtained maximum rate of O₂ consumption after 29 h (4.002 μL/min) while water sample cells obtained maximum rate after 55 h (2.033 μL/min (Fig. 2).

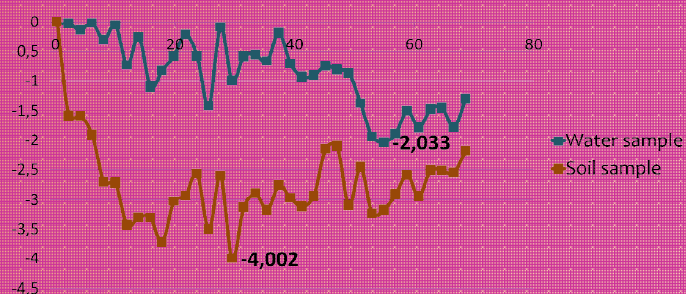


Figure 2: Changes of O₂ consumption rates during experiment

Total decrease of TPH at the end of respiration experiment was 87.1 %, and 69.2 % for soil and water sample, respectively.

Acknowledgements

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