Electronic Journal of Biotechnology 44 (2020) 58–59

Contents lists available at ScienceDirect

Electronic Journal of Biotechnology

Video

Release of formaldehyde during the biofiltration of methanol vapors in a peat biofilter inoculated with *Pichia pastoris* GS115

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ARTICLE INFO

Article history:
Received 31 January 2020
Accepted 31 January 2020
Available online 13 February 2020

Keywords:
Biofilter
Biofiltration
Biomass
Environment
Formaldehyde
Methanol
Methylotrophic yeast
Pichia pastoris
Secondary emissions
Waste air treatment

ABSTRACT

Background: Methanol can be effectively removed from air by biofiltration (Shareefdeen et al., 1993; Babbitt et al., 2009 [1,2]). However, formaldehyde is one of the first metabolic intermediates in the consumption of methanol in methylotrophic microorganisms (Negruţa et al., 2010 [3]), and it can be released out of the cell constituting a secondary emission.

Results: The total removal of methanol was achieved up to input loads of 263 g m^{-3} h^{-1} and the maximum elimination capacity of the system was obtained at an empty bed residence times of 90 s and reached 330 g m^{-3} h^{-1} at an input methanol load of 414 g m^{-3} h^{-1} and 80% of removal efficiency. Formaldehyde was detected inside the biofilter when the input methanol load was above 212 g m^{-3} h^{-1}. Biomass in the filter bed was able to degrade the formaldehyde generated, but with the increase of the methanol input load, the unconsumed formaldehyde was released outside the biofilter. The maximum concentration registered at the output of the system was 3.98 g m^{-3} when the methanol load was 672 g m^{-3} h^{-1} in an empty bed residence times of 60 s.

Conclusions: Formaldehyde is produced inside a biofilter when methanol is treated in a biofiltration system inoculated with *Pichia pastoris*. Biomass present in the reactor is capable of degrading the formaldehyde generated as the concentration of methanol decreases. However, high methanol loads can lead to the generation and release of formaldehyde into the environment.

How to cite: Guerrero K, Arancibia A, Caceres M, et al. Release of formaldehyde during the biofiltration of methanol vapors in a peat biofilter inoculated with Pichia pastoris GS115. Electron J Biotechnol 2019;40. https://doi.org/10.1016/j.ejbt.2019.04.003.

Transcript

0.01–0.03	**Release of formaldehyde during the biofiltration of methanol**.
0.16–0.22	In this video, we will show the biofiltration system described in the materials and methods section of the article.
0.23–0.30	The experimental system is inside a camera with negative pressure to assure that the gasses leave the space through the ventilation system of the building.
0.32–0.35	In this closed camera, it is possible to identify the following areas.
0.38–0.42	In a first zone, the saturated air in specific compounds is generated.
0.43–0.55	In this zone, a set of flow mass controllers and flowmeters distribute the gaseous streams to their respective biofiltration columns and allows setting the load and retention time of the experiment.
0.57–1.01	Finally, in this zone, we can locate the biofilters and biotrickling filters.
1.02–1.08	Now, we can see in more detail the biofilter used to treat air contaminated with methanol.
1.09–1.13	The bioreactor was made using an acrylic pipe and PVC flanges and joints.
1.14–1.18	The design is shown in this diagram.
1.20–1.32	This biofilter was packed with a mixture of peat, perlite and crushed shells, and inoculated with *Pichia pastoris*, a yeast with the ability of consuming methanol from the gas phase.
1.33–1.38	Samples were taken at different heights of the column to determine the profile of methanol through the biofilter.
1.39–1.45	The solid medium was also sampled periodically to measure moisture, pH and the viability of the biofilm.
1.47–1.52	The gas composition at the inlet and outlet of biofilter was made by gas chromatography.
1.56	**Main Results and Conclusion.**
1.57–2.17	Formaldehyde is produced inside a biofilter when methanol is treated in a biofiltration system inoculated with *Pichia pastoris*. Biomass present in the reactor is capable of degrading the formaldehyde generated as the concentration of methanol decreases. However, high methanol loads can lead to the generation and release of formaldehyde into the environment.

DOI of original article: https://doi.org/10.1016/j.ejbt.2019.04.003.
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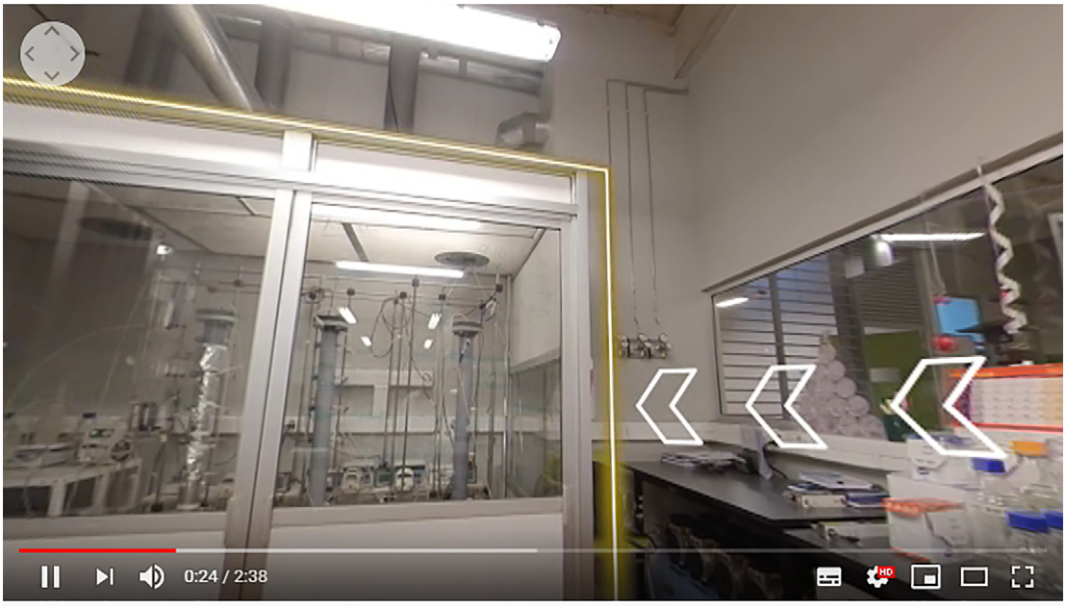
Peer review under responsibility of Pontificia Universidad Católica de Valparaíso.

https://doi.org/10.1016/j.ejbt.2020.01.010

Video

This is a 360 video, therefore to view it correctly, it is necessary to scroll through the screen to navigate the laboratory environment following the direction indicated by the arrow. To have an immersive experience a head-mounted display can be used.



Release of formaldehyde during the biofiltration of methanol

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