

Removal of ethyl acetate from air in a membrane bioreactor

*F. J. Álvarez-Hornos, D. Volckaert, P. M. Heynderickx, H. Van Langenhove
Research Group EnVOC, Ghent University, 9000 Ghent, Belgium.*

Biological gas treatment techniques have been studied and used as alternatives for the traditional physical-chemical techniques for the control of VOCs emissions [1]. However, these techniques show major challenges, especially for poorly biodegradable compounds. The membrane bioreactor (MBR) for waste gas treatment is a technological advantage that makes it possible to separate gas and liquid phases. Pollutants diffuse through the membrane and are subsequently degraded by the microorganisms in the biofilm. The scarce literature MBR data which are mainly focused on toluene removal [2] indicate that the MBR could potentially be more effective than conventional biosystems, although it still requires additional investigation and optimization with other compounds and with complex VOC mixtures. This study was performed to evaluate the performance of a MBR to treat gas contaminated with ethyl acetate under various operating conditions. A composite membrane consisting of a porous polyacrylonitrile support layer coated with a very thin (0.3 μm) dense polydimethylsiloxane top layer was used.

The membrane bioreactor was operated under continuous loading for 3 months. Several operational conditions were tested: ethyl acetate concentration varied from 400 to 2500 mg Nm^{-3} at gas empty bed residence times between 15 and 60 s. At the moment, a maximum elimination capacity of 206 $\text{g m}^{-3} \text{h}^{-1}$ with 70% of removal efficiency (RE) has been achieved working at 15 s of EBRT. Next experiments will provide useful information in order to optimize the MBR in terms of EBRT and a comparison with the conventional biotechnologies will be carried out.

[1] Alvarez-Hornos FJ, Gabaldon C, Martinez-Soria V, Marzal P, Penya-Roja JM, Izquierdo M. *Biotechnol. Bioeng.*, 96, 651–660 (2007).

[2] Jacobs P, De Bo, Demeester K, Verstraete W, Van Langenhove H. *Toluene Biotechnol. Bioeng.*, 85, 68–77 (2004).