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Producing energy through gases from biomass

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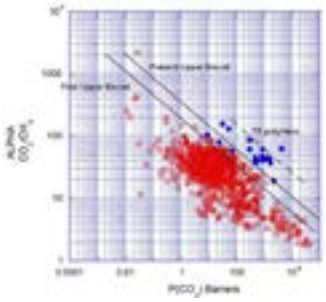
Biomass is renewable biological matter (e.g. wood, crops, algae, food waste…), which can be processed to generate targeted biomolecules, biomaterials or bioenergy. Bioenergy can be stored as bioethanol or biodiesel, which are commonly known liquid fuels obtained from biomass. But, bioenergy can also be stored under the form of gases, in particular biomethane and biohydrogen, which can be used for mobility. In this presentation, we focus on biomethane.Biogas is a mixture of gases, composed mainly of methane (~55%) and CO_2 (~45%). It is formed by the anaerobic microbiological conversion of organic matter. Biogas can be upgraded into biomethane, which may then be used for mobility (heavy goods vehicles, maritime transportation). In 2014, the European Commission recommended to develop European-wide CNG and LNG filling station infrastructures by launching the "Clean Fuel Strategy". Improvement of the biomethane production process is thus key to deploy clean transportation through biobased CNG and LNG. [1] To improve biomethane production, developments are needed to increase biogas production, reduce operating costs and optimize biogas upgrading. Several technologies can be considered for each. In this presentation, we focus on increasing biogas production through lignocellulosic degradation by biological pre-treatments. Indeed, agricultural waste is difficult to digest due its generally high content in lignocellulose. [2],[3] Agricultural waste is critical since it will represent 90% of the available feedstock for anaerobic digestion in France in 2030, according to an ADEME report. [4] We will also present the latest achievements in membrane permeation technology employed in Air Liquide upgrading units. Formulation of the polymers used in membranes can be improved to have a higher selectivity and at the same time, a higher permeance of CO_2. [5],[6] The right combination of selectivity and permeance can decrease operating or capital costs.



Recent Publications

1. EU directive 2014/94/EU on the deployment of alternative fuels infrastructure
2. Schroyen et al. (2015), "Effect of enzymatic pretreatment of various lignocellulosic substrates on production of phenolic compounds and biomethane potential", Bioresource Techno. Vol. 192, pp. 696-702
3. Cater et al. (2014), Methods for Improving Anaerobic Lignocellulosic Substrates Degradation for Enhanced Biogas Production, Springer Science Reviews, Vol. 2 (1–2), pp. 51–61
4. ADEME (2013), "Estimation des gisements potentiels de substrats utilisables en méthanisation", 117 p.
5. Lin and Yavari (2015), "Upper bound of polymeric membranes for mixed-gas CO2/CH4 separations", Journal of Membrane Sci. Vol. 475, pp. 101-109

Biography

Aude Bertrandias is an R&D engineer at the Research Center Paris-Saclay of Air Liquide. She is part of the Life Science Department, which develops innovative solutions for biotechnology, food and beverage applications and pharmaceuticals. Her main topics of research concern the improvement of biogas production, from both a quantitative and qualitative point of view. She also works on other subjects, linked to bioprocessing. Her background as an engineer in life science and PhD in process engineering enable her to approach bioprocessing projects with a dual perspective.

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