



**PhD Proposal 2017**

<b>School: Ecole Centrale de Marseille</b>	
<b>Laboratory: LM2P2</b>	<b>Web site:</b> <a href="http://www.m2p2.fr">http://www.m2p2.fr</a>
<b>Team: Membrane processes team</b>	<b>Head of the team: philippe Moulin</b>
<b>Supervisor: Philippe.moulin</b>	<b>Email<sup>1</sup>: philippe.moulin@univ-amu.fr</b>
<b>Collaboration with other partner during this PhD:</b>	
<b>In France: Industrial partners</b>	<b>In China:</b>

<b>Title: Hybrid membrane process to remove emerging pollutants VOC in gas or liquid effluents</b>
<b>Scientific field: Membrane processes, chemical engineering</b>
<b>Key words: Membrane, gas and water treatment, adsorption, VOC</b>

**Details for the subject:**

The rapid growth of the number of industries and the generation of VOCs in water or in air require for more attention on the risk assessment and waste management associated with emerging pollutants (VOC). To fully evaluate the risk posed by VOC in air or in water, hazard and potential exposure must be taken into consideration. However, knowledge about the potential exposure of VOC in air/aquatic environment are still lacking, such as their occurrence levels, forms, environmental pathways, transformation and fate. Several factors such as the low expected VOC concentrations (from  $\text{ng}\cdot\text{L}^{-1}$  to  $\mu\text{g}\cdot\text{L}^{-1}$ ), and complex environmental matrix, make it extremely difficult to effectively separate and characterize

<sup>1</sup> Put here 1, 2 or 3 email personal addresses, separated by commas, of colleagues who will have access to folder of student candidates on the web site. Do not use generic laboratory addresses.

actually existing EP-VOC in natural samples. Thus, it is urgent to develop new process to concentrate these compounds in a variety of gas or aqueous matrices.

For a large proportion of VOC, before their release into natural water, treatment plants could be the final barriers. Hence, the management of gas or wastewater containing VOC is crucial for exposure reduction in environment. There is pressing need to develop new effective separation technologies and optimize the present separation processes, on purpose to achieve a better removal efficiency and to save operating costs.

The use of hybrid process coupling adsorption and membrane processes in the study of VOC are interesting and promising, since membrane filtration can not only be used as fractionation techniques prior to further analysis, but also used to remove by adsorption VOC.

In the case of VOC a process adsorption-membrane will be described and based on this process, we would like to study the adsorption capacity in term of efficiency and regeneration and the separation by membrane

This work is divided in 2 parts:

- Filtration at a lab scale of synthetic solutions (gas and liquid)
- Filtration of real effluent industry (petrochemical, chemistry, etc..)

### References:

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Heymes, F., P. Manno Demoustier, F. Charbit, J.L. Fanlo and **P. Moulin**, Treatment of gas containing hydrophobic vocs by a hybrid absorption –pervaporation process: the case of toluene. *Chem. Eng. Sci.*, 62, n°9 (2007) 2576-2589

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