ParisTech AgroParisTech

RESEARCH TOPIC FOR THE PARISTECH/CSC PHD PROGRAM

Field: **Energy, Processes**

Subfield: **Process Engineering**

Title: **Coupling and intensification of separation processes**

ParisTech School: **AgroParisTech**

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Lab location: **REIMS (40 min from Paris)**
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Short description of possible research topics for a PhD:

The subject of this paper deals with the coupling of processes to improve the performance of extraction (liquid/solid) and functionalization processes. Two technologies will be mainly studied for intensification:

(i) membrane processes. Some results (Ioannou et al. (2020) have been obtained on improving the glycosylation yield of resveratrol by coupling the enzymatic reaction with a membrane process (Enzymatic Membrane Reactor). The objective will be to optimize functionalization reactions used in the chemistry department of our unit. The experiments will be carried out on a laboratory scale in small volumes (0.5 L) and then on a pilot scale (5 L).

(ii) membrane contactors. The coupling of the extraction processes with membrane contactor technology will be applied in order to increase the extraction yields but also to increase the extract purity. Extraction processes deal with vegetal biomass in order to valorize agro-industrial products.

Energy and material balances will be carried out to show the interest of the coupling of different technologies. The experiments will be carried out according to the DOE methodology (Design Of Experiments).

Required background of the student:

The student will have a background in process engineering and / or chemical engineering. Knowledge of membrane processes, extraction processes (L / L, S / L), analytical methods (HPLC, SM) and design of experiments will be required. A good level in English is obligatory.

A list of 5 (max.) representative publications of the group:

1. Ioannou *et al.* (2020) Implementation of an enzyme membrane reactor to intensify the enzymatic β-glycosylation of resveratrol. Submitted to Industrial & Engineering Chemistry Research.
2. Reungoat *et al.* (2020). Optimization of an ethanol-water based sinapine extraction from mustard bran using Response Surface Methodology. Food Bioprod. Process., 122, 322-331. https://doi.org/10.1016/j.fbp.2020.06.001
3. Chemarin *et al.* (2019) Recovery of 3-hydroxypropionic acid from organic phase after reactive extraction with amines in an alcohol-type solvent. Sep. Pur. Technol. DOI: 10.106/j.seppur.2019.02.026
4. Chemarin *et al.* (2018) Toward an in-situ product recovery of biobased 3-hydroxypropionic acid: influence of bioconversion broth components on membrane-assisted reactive extraction. J. Chem. Technol. Biotechnol. DOI: 10.1002/jctb.5845
5. Fayet *et al.* (2018) Detoxification of highly acidic hemicellulosic hydrolysate from wheat straw by diananofiltration with a focus on phenolic compounds. J.Membrane Sci. DOI: 10.1016/J.memsci.2018.08.045