Subject: “Optimization of a catalytic process for the CO₂ purification derived from an oxyfuel combustion in the cement industry”

Joint-supervised PhD thesis fellowship
ULCO (France) – UMONS (Belgium)/ECRA Chair@UMONS

Context:

Previous studies presented in the different reports of ECRA (European Cement Research Academy) highlighted that two CO₂ capture processes can be applied in a cement plant: post-combustion and oxyfuel combustion.

In the context of the ECRA Chair « From CO₂ to Energy: Carbon Capture in Cement Production and its Re-use » at the Faculty of Engineering (FPMs) of UMONS, related to the study of CO₂ capture processes applied to the cement industry and its conversion into valuable compounds such as methanol, these two CO₂ capture technologies are studied. The CO₂ captured has to be purified (de-dust, de-SOₓ, de-NOₓ, etc.) before being reused for its conversion into a valuable compound.

The team “Catalytic treatment and clean energy” of the Unit of environmental chemistry and interaction on the living organisms (UCEIV, ULCO) works on the purification and the valorization of the CO₂ coming from oxyfuel combustion. In a project of the INNOCOLD institute with EDF-LNG company, a first PhD on the catalytic purification of CO₂ gave good results at the micro-pilot scale.

In the context of the CO₂ purification derived from an oxyfuel combustion the present PhD subject deals with the study of the catalytic reduction of NO in nitrogen by the reducing agent CO which will be oxidized in CO₂. This innovative process is characterized by the challenge of high water and CO₂ contents in the flue gas to treat. Different catalytic materials will be tested in a micro-reactor and optimized. Tests at the micro-pilot scale will be also achieved, with a modelling of the catalytic process at industrial scale applied to the cement industry, allowing finally a techno-economic analysis of the process.

During the PhD thesis, several exchanges will be envisaged with internal collaborators (other PhD students, post-docs, etc.) and also with external collaborators such as ECRA members.

Candidate’s profile:

Education: Candidates must hold a Master degree (5-years duration) in Chemical engineering/Chemistry or fields (such as industrial chemistry, mechanical/ environmental engineering, ...) with a strong interest in energy, process engineering and optimization.

Languages: A good knowledge of English is required, both oral and written; a knowledge of French would be an asset.
Other skills: Writing skills, good interpersonal and communication skills, rigor, conciseness and motivation with knowledges on catalytic processes and simulation/modeling tools (such as ASPEN Plus, ASPEN Hysys).

The candidate will be hosted in nice working environments under a challenging job at dynamic and ambitious universities: ULCO (France) and UMONS (Belgium).

The PhD thesis will be joint-supervised.

ULCO:

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Applications (CV + motivation letter showing the adequacy with the requested profile) should be sent to: siffert@univ-littoral.fr and diane.thomas@umons.ac.be.

Salaries are in accordance with the Universities’ agreement for a joint-supervised PhD thesis.

This 3-year PhD Thesis is expected to start in September or October 2018.