

DOCTORAL SCHOOL “ MATERIALS, RADIATION AND ENVIRONMENTAL SCIENCES ” (ED 104)

UNIVERSITY: University of Lille, Sciences and Technologies

PhD. programm : Molecules and Condensed matter

Title of the thesis : Catalytic aminations for the sustainable synthesis of amines and amides

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THESIS PROJECT

This project concerns the general problem of implementation of eco-efficient processes for the syntheses of nitrogen compounds that are applied in many fields of interest (agrochemicals, pharmaceuticals, lubricants, surfactants, polymers...). If methods have proven their usefulness for the synthesis of amines whether primary, secondary or tertiary, those based on catalysis are most suitable for an implementation into sustainable chemical processes. In this context, the laboratory has been actively involved for several years in the development of selective catalytic processes for preparing amines at large.¹ We are now focusing our research efforts on the development of more direct methods that can be applied to raw materials readily available or bio-sourced. It is important to note that these direct pathways to amines are very popular and are at the heart of current scientific and industrial problems.²

The topic of the proposal will concern the study of various innovative approaches for the design of catalytic systems applied to the synthesis of primary and secondary amines and amides. Several aspects will be addressed in order to define the most promising economic viability of the processes: a) identification of the catalytic systems according to targeted products, systems based on abundant and non-toxic metals will be considered as a priority; b) the selective synthesis of primary and secondary amines and amides will be considered on the basis of their application potential and directly related to the raw materials considered; c) mechanistic studies and optimization of catalytic systems will be carried out; d) recycling of homogeneous catalysts with their immobilization in various liquid media; e) changes in scale to identify the application potential of the processes.

1. (a) Michon C., Medina F., Capet F., Roussel P., Agbossou-Niedercorn F., *Adv. Synth. Catal.* **2010**, 352, 3293-3305; (b) Medina F., Michon C., Agbossou-Niedercorn F., *Eur. J. Org. Chem.* **2012**, 6218-6227; (c) Medina F., Duhal N., Michon C., Agbossou-Niedercorn F., *Comptes Rendus Chimie* **2013**, 16, 311-317; (d) Michon C., Medina F., Abadie M.-A., Agbossou-Niedercorn F., *Organometallics* **2013**, 32, 5589-5600; (e) Michon C., Abadie M.-A., Medina F., Agbossou-Niedercorn F., *Catalysis Today* **2014**, 235, 2-13; (f) Abadie M.-A., Trivelli X., Medina F., Capet F., Roussel P., Agbossou-Niedercorn F., Michon C., *ChemCatChem* **2014**, 6, 2235-2239; (g) Abadie M.-A., Medina F., Agbossou-Niedercorn F., Michon C., *Chimica Oggi* **2014**, 32, 19-21.
2. (a) Pattabiraman V. R., Bode J. W., *Nature* **2011**, 480, 471-479; (b) Gunanathan C., Milstein D., *Science* **2013**, 341, 249-262.