**MASTER DE CHIMIE DE PARIS CENTRE - M2S2**
**Proposition de stage 2019-2020**
**Internship Proposal 2019-2020**

***Parcours / Specialty(ies) :***
☐ Chimie Analytique, Physique et Théorique / *Analytical, Physical and Theoretical Chemistry* :
☐ Chimie Moléculaire / *Molecular Chemistry* :
☐ Chimie et Sciences Du Vivant/*Chemistry and Life Sciences* :
☒ Matériaux / *Materials:*
☒ Ingénierie Chimique / *Chemical Engineering:*


**Laboratoire d'accueil / *Host Institution***
Intitulés / *Name* : Laboratoire de Réactivité de Surface
Adresse / *Address* : Tour 43-33 3ème étage, Sorbonne Université, 4, place Jussieu, 75005 Paris
Directeur / *Director (legal representative) : Hélène Pernot*
Tél / *Tel* : 01 44 27 55 33
E-mail : helene.pernot@sorbonne-universite.fr

**Equipe d'accueil / *Hosting Team :***
Adresse / *Address :* Laboratoire de Réactivité de Surface
Responsable équipe / *Team leader* :
Site Web / *Web site :*
Responsable du stage (encadrant) / *Direct Supervisor :* Juliette Blanchard
Fonction / *Position : Chargée de Recherche*
Tél / *Tel* : 0144274914
E-mail : juliette.blanchard@sorbonne-universite.fr


Période de stage / *Internship period* * : 5-6 mois à partir du 13 janv 2019
Gratification / *Salary : https://www.service-public.fr/simulateur/calcul/gratification-stagiaire)*

***Titre / Title :***
**nanocomposites zeolithe@basic oxide de type coeur@coquille: preparation et application à la catalyse tandem acide-base**
**zeolite@basic-oxides core-shell nanocomposites as catalysts for tandem acid-base reactions**†

1. Projet / *Project*
The synthesis of complex organic molecules usually requires several successive catalytic steps and, between them, intermediate isolation and purification steps. Performing all these catalytic steps in a single reactor (so-called one-pot multi-steps catalysis) is highly desirable because it is simpler, more cost-effective and more environmentally-benign (thanks to waste reduction). This usually requires the simultaneous presence of two or more catalysts in the reactor. Immobilisation of these catalysts on a support is often a major requirement, not only because it allows an easier recovery of the catalysts but also because a site isolation of the different catalysts is often necessary to avoid mutual quenching of the active sites. This is specifically the case for acid-base bifunctional catalysis, that plays a key role in the synthesis of many fine chemicals [1,2]. Indeed, homogeneous acid and base are antagonist catalysts that will immediately neutralize each other when put in the same reactor, whereas anchoring these two catalysts on a solid support can prevent their neutralization by keeping them apart [3].

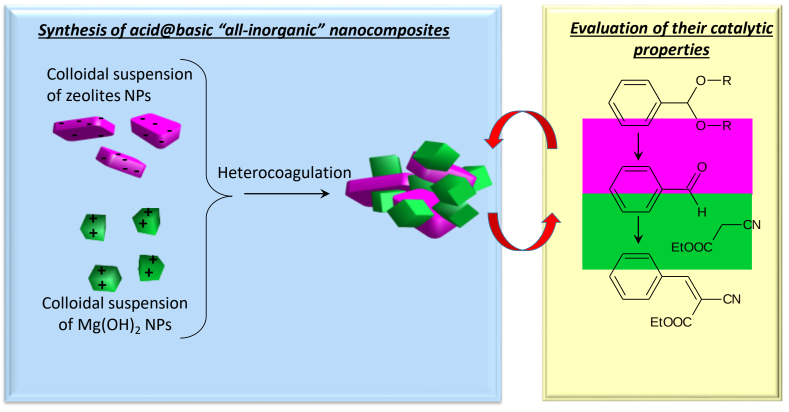
* 5 mois à partir du 13 janv 2020 / *5 months not earlier than January, 13th 2020.*

† *For an english version of the project, please send an e-mail to juliette.blanchard@sorbonne-universite.fr*

The objective of the present project will be to design “all-inorganic” core/shell composites with different intimacies between the acid and basic domains. The core of the catalysts will be made of a zeolite nanoparticle (bearing the acidic function) and the shell of basic oxides (MgO). The two components will be associated through heterocoagulation [4]. This new type of catalyst will associate the good stability of inorganic materials with a high intimacy of the acid & basic functions thanks to nano-scale intimacy of the two components. These catalysts will be tested as tandem acid-base bifunctional catalysts in order to investigate the effect of the intimacy between the acid and basic component on activity and selectivity.

2. Techniques ou méthodes utilisées / *characterization techniques & synthesis methods*

*Synthesis:* preparation of inorganic colloidal particles (zeolite and $Mg(OH)_2$, preparation of mixed oxides)
*Characterization:* X-ray diffraction, Physisorption, TEM, measurement of particle size (DLS) and of their zeta potential, FTIR of probe molecules (density of acidic and basic sites)
*Catalysis* (if the project’s progress unables it): catalytic test in batch reactor and liquid phase, chromatograpy



Overview of the research project

3. Références / *References*

[1] S. Shylesh, W.R. Thiel, Bifunctional Acid–Base Cooperativity in Heterogeneous Catalytic Reactions: Advances in Silica Supported Organic Functional Groups, ChemCatChem. 3 (2011) 278–287. doi:10.1002/cctc.201000353.
[2] D. Jagadeesan, Multifunctional nanocatalysts for tandem reactions: A leap toward sustainability, Appl. Catal. Gen. 511 (2016) 59–77. doi:10.1016/j.apcata.2015.11.033.
[3] T.L. Lohr, T.J. Marks, Orthogonal tandem catalysis, Nat. Chem. 7 (2015) 477–482. doi:10.1038/nchem.2262.
[4] O. Ben Moussa, L. Tinat, X. Jin, W. Baaziz, O. Durupthy, C. Sayag, J. Blanchard, ACS Catalysis 8 (2018) 6071-6078.