

PhD subject :

**« Novel hybrid materials for the substitution of critical materials
in exhaust gas treatment catalysts »**

Context : In the context of European Pollution management, the arrival of norm Euro 6 by 2014 (reduction of nitric oxide exhaust pollutants, NO_x by 56% and 65% efficiency) followed by Norm Euro7 (80% efficiency) requires the improvement of the current technologies, including the current catalytic phases, which often rely on critical materials (such as Pt, Pd, Rh, ...). In some current NO_x trap systems the used catalytic phases have a twofold role: firstly the oxidation of NO in NO₂ and related nitrate trap—typically with critical an precious metal Rh— and secondly, the subsequent NO_x reduction to N₂, typically with Pt and Pd centers.

Project : This project aims at the development and testing of novel catalytic materials able to (i) improve the system efficiency and (ii) reduce the use or even completely substitute the precious/critical material. It relies on the designed synthesis of nanoparticles characterized by

- smaller size (thus increasing efficiency and reducing overall metal consumption)
- novel mixed phases (therefore reducing the molar fraction of the precious metal, ex/ PtSn)
- novel composition (therefore completely substituting the precious metal) ex. AgCu.

The development will be based on the original surface organometallic nanoparticle growth and deposition on inorganic oxides mastered by the Lyon 1 team. The catalytic testing will be performed in collaboration with the expert team from Politecnico of Torino and CEA.

Candidate: The ideal candidate will have a solid background in at least two of the following three fields: organometallic chemistry, hybrid materials and/or heterogeneous catalysis.

Supervisors:

in LYON (FRANCE - HOME Location) : Dr . C. THIEULEUX and Dr. E.A. QUADRELLI
(LYON 1 university – C2P2 Unit (UMR 5265 CPE-CNRS-Unily1)

in TORINO (ITALY- HOST Location) : Prof. R. PIRONE (Politecnico di Torino)

in GRENOBLE (FRANCE - ASSOCIATE Location) : Dr. Sébastien DONET (CEA)