

UNIVERSITY: LILLE , Faculty of Sciences and Technologies

Scientific field : Chemistry – Catalysis

Title of the thesis: Assisted post-combustion catalysis for the conversion of methane at low temperature:
Application to vehicles powered by natural gas.

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Laboratory: UCCS UMR8181

Expected/obtained funding: Univ. Lille 100%

ABSTRACT

The thesis subject proposes the application of a new concept of assisted catalysis by coupling thermal and electromagnetic energy to activate chemically stable small molecules. Methane is the target molecule. The intended application is in the development of new modes of carburation with engines powered by natural gas. Adapting efficient low temperature afterburner systems is a challenge. Indeed, the chemical stability of methane requires the use of large amounts of precious metals and high operating temperatures. Electromagnetic induction allows the active sites of the catalyst to be locally heated to temperatures much higher than those of the exhaust gases during cold start. This strategy would also make it possible, for a well-optimized system, to greatly reduce the precious metal content or even to develop new active phases which would be devoid of them.

In practice, the thesis work will include two distinct parts: (i) optimization of the reactor conditions starting from simple gas mixtures to more complex gas compositions containing in particular inhibiting agents such as sulfur and - (ii) the development of catalysts exhibiting specific compositions and structural properties to exhale this induction effect.

The expected effects of magnetic induction are, on the one hand, to overcome the effects of the deactivation of the catalyst by poisoning at low temperature and, on the other hand, to lead to more compact and efficient pollution control systems. less expensive.

Planned recruitment date : 1st october 2021

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Additional remarks/comments :

Missions : The main missions will be associated with the development of experimental protocols for the preparation of catalytic materials, their physicochemical characterization and their implementation. A part will be devoted to the installation of a device for the study of the catalytic reaction. The doctoral student must demonstrate autonomy in the discussion of these experimental results and their interpretation with regard to the elements of the bibliography and be able to disseminate information.

Profile of the candidates : Person having obtained an engineering degree or a Research Master 2 with in-depth knowledge in heterogeneous catalysis, inorganic chemistry. The candidate must demonstrate a satisfactory level of written and oral English sufficient to read and understand the scientific bibliography. He will have to show initiative in his work, gradually leading him to be autonomous

