

POSTDOCTORAL POSITION

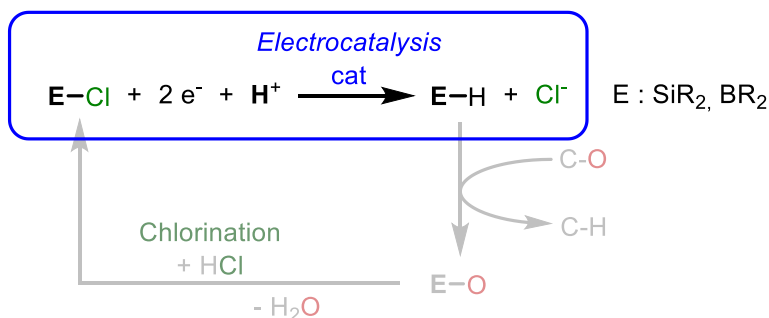
HOMOGENEOUS CATALYSIS AND MOLECULAR ELECTROCHEMISTRY

Energy efficient electrocatalytic synthesis of hydrosilanes and hydroboranes

Hydrosilanes (Si-H) are versatile reagents that find various applications in industry, from the synthesis of ultra-pure silicon for electronic purposes to the preparation of silicone polymers. Hydrosilanes are also known to be efficient reductants in organic chemistry, especially for the reduction of carbonyl derivatives and are often preferred to other methods because of their ease to be handle and the mild conditions usually required for these reactions. However, the synthesis of hydrosilanes are very energy intensive, mainly by the reduction of chlorosilanes in harsh conditions, themselves obtained from silicon at high temperature (Müller-Rochow process).

The Carbon Circular Economy requires shifting the carbon feedstock from fossils sources to renewable sources (e.g. CO₂, biomass, but also anthropogenic wastes). A sustainable substitution of petrochemical derivatives by renewable materials needs the development of new and economically competitive methods for the transformation of highly oxygenated compounds. Hydrosilanes (as well as hydroboranes) are excellent candidates for such reactions but their global balances are hampered by 1) the energetic assessment of the reductant preparation and 2) the recyclability of the Si (B)-O by-products formed.

This work :



While the silanols and siloxanes waste may be recycled into the chloro- species through dehydration with chloric acid, energetically efficient synthetic way for hydrosilanes are still lacking. Yet, our recently reported catalytic conversion of chlorosilanes to hydrosilanes from H₂ in mild conditions. The post-doctoral fellow will work on new strategies involving electrochemistry and homogeneous catalysis to overcome identified scientific obstacles in hydrogenolysis reactions of chlorosilanes. Methodologies designed will be applied in a second time for the synthesis of hydroborane from chloroboranes.

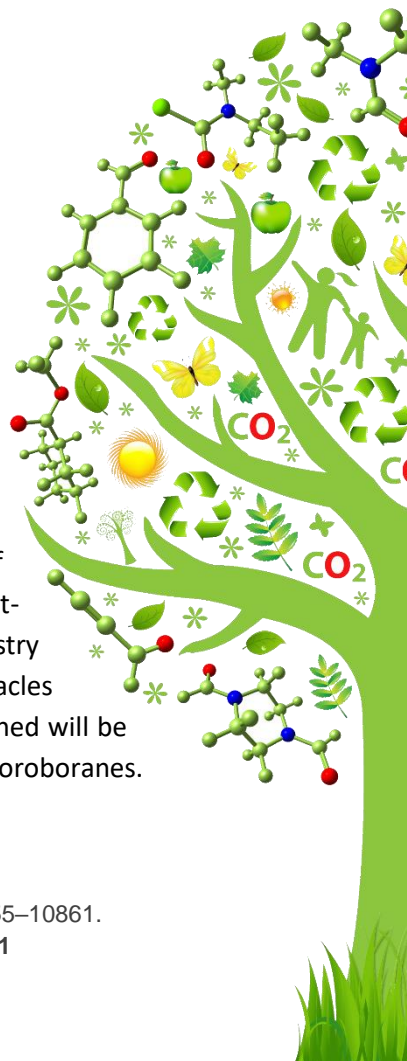
Literature references from the host team:

- [1] C. Chauvier, T. Cantat, *ACS Catal.* **2017**, 7, 2107-2115.
- [2] G. Durin, J-C. Berthet, E. Nicolas, T. Cantat, *ACS Catal.* **2021**, 11, 10855–10861.
- [3] G. Durin, J-C. Berthet, E. Nicolas, P. Thuéry, T. Cantat, *ChemRxiv.* **2021**



Dr. THIBAUT CANTAT
Commissariat à l'Énergie Atomique et aux Énergies Alternatives

thibault.cantat@cea.fr



Position

1 year, available from January 2022

Gross salary: ca. 2850 €/month

Location: CEA Saclay, University of Paris-Saclay

The applicant must hold a PhD in molecular chemistry with an experience in electrochemistry and/or electro-catalysis.

To apply, please contact:

Dr. Thibault Cantat, thibault.cantat@cea.fr



Dr. THIBAUT CANTAT
Commissariat à l'Énergie Atomique et aux Énergies Alternatives

thibault.cantat@cea.fr