

Marie Skłodowska-Curie Actions Individual Fellowships

2021 – Supervisor's Profile

1. Details of the GREMAN supervisor	
Name of the supervisor	Dr. Brice Le Borgne
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2. Research activity
<p>The development of innovative devices for carbon capture and transformation has reached a growing interest for obvious reasons. The constant innovation in terms of material synthesis allows us to imagine new solution to reduce or locally reduce CO₂ emissions. One of the solutions is the well-known reduction of CO₂. For researchers, the Holy Grail would be to be able to transform CO₂ into a more valuable substance (economically or environmentally) such as methane (CH₄), formic acid (CH₂O₂). Another approach would be to simply degrade carbon dioxide into a non-toxic substance.</p> <p>The use of porous silicon (P-Si) in such a competitive field could be helpful because this material offers a high versatility. It is indeed possible to form pores of different shapes and different dimensions from a controlled to highly disordered structure. Moreover, the use of semi-conductors based photoelectrodes is highly valuable to perform efficient electrochemistry.</p> <p>We would be interested in hosting a MSCA fellow to carry out investigation on the most efficient P-Si structure in order to improve selectivity during the reduction of CO₂ and to propose a CMOS-compatible technology*.</p> <p style="text-align: right;">*contact us for more details</p>

3. Description of the Research group
<p>Research on porous silicon in GREMAN has led to more than 60 papers and 6 patents since 2003. Based on these results, a start-up was created (SILIMIXT) by Laurent Ventura, former GREMAN researcher.</p> <p>Our lab seeks to develop new applications of this material in microelectronics devices (electric isolation under RF devices, anisotropic structures by electromechanical etching for 3D devices, electrical isolation around AC switches electrochemical etching of wide band gap semi-conductors) or energy micro-sources (PS hydrogen diffusion layers for Proton Exchange Membrane micro Fuel Cells, PS ion conducting membranes for glucose PEMFC, Si nanowires and PS for Lithium Micro-batteries).</p> <p>Some recent example of achievements involving porous silicon can be mentioned. The highest specific surface area ever measured for porous silicon (1125 m²/g) was reached using new HF electrolyte compositions [A. Loni <i>et al.</i>, in J. of Solid State Science & Technology, Vol. 4, No 8, pp. P289-P292, 2015]. These particles are highly photoluminescent (Figure 2). This work was performed in collaboration with PSimedica (UK) and Pr Michael Sailor's group in San Diego.</p>

The team has recently grown and hosts 1 professor, 3 associate professors, 2 postdocs and 3 PhD students. We want to explore new fields in agreement with sustainable and clean energy sources and we welcome new talents.

4. MSCA Research area panels

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| <input checked="" type="checkbox"/> Chemistry (CHE) | <input type="checkbox"/> Environmental Sciences and Geology (ENV) |
| <input type="checkbox"/> Social Sciences and Humanities (SOC) | <input type="checkbox"/> Life Sciences (LIF) |
| <input type="checkbox"/> Economic Sciences (ECO) | <input type="checkbox"/> Mathematics (MAT) |
| <input checked="" type="checkbox"/> Information Science and Engineering (ENG) | <input checked="" type="checkbox"/> Physics (PHY) |