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The future of energy supply depends on innovative breakthroughs regarding the design of efficient systems for the conversion and storage of energy. Fuel cell is one of these technologies that could offer suitable solutions, however the cost of the platinum catalyst represents a limitation for its present development. That is why more and more platinum-free catalysts are developed. This is precisely the aim of the European project PEGASUS.
The improvement of the characterization of these new catalysts is a challenge that scanning electrochemical microscopy (SECM) could take up. SECM enables to study the intrinsic properties of platinum-free catalysts by probing a very low amount of material, which allows to get rid of the transport within the material. A benchmarking of some catalysts developed in the project PEGASUS will be achieved in order to compare the performances of the different catalysts versus the oxygen reduction reaction (ORR).
Combined with modeling, SECM will enable a better comprehension of the origin of the measured performances. In particular, the catalytic activity will be linked to the agglomeration state of the material that can be controlled and characterized thanks to a precise deposition method and thanks to the atomic force microscope (AFM) for the characterization. This will lead to the improvement of agglomerate models used for the modeling of PEM fuel cells.
Finally, the production of hydrogen peroxide which is a source of degradation in fuel cells will be also investigated by SECM.