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Mapping the intrinsic electrocatalytic activity of ORR catalysts with Scanning electrochemical microscopy

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With the advent of non-noble metal catalysis for oxygen reduction reaction, there is an important need to develop simple and efficient electrochemical method to characterize accurately their electroactivity. Indeed, to compete with the very efficient platinum catalyst, electrochemical studies with RDE are generally performed with higher loading possibly leading to rough and heterogeneous films. In these conditions, electrochemical activities can be overestimated. In this project –as a part of the European project PEGASUS- we developed the use of a Scanning ElectroChemical Microscopy (SECM) [1] to investigate the electrocatalytic activity of oxygen reduction reaction (ORR) catalysts. SECM is a local probe technique that consists in displacing a micrometric electrode near a substrate in order to obtain an electrochemical image.
Herein, we show how we can use the technique to investigate in the same conditions and time the intrinsic catalytic activity of different PGM-free catalysts for ORR, thus completing the information one gets with RDE. This methodology permits to understand the origin of the achieved performances without distortion due to the averaging of the response when working at the material level.

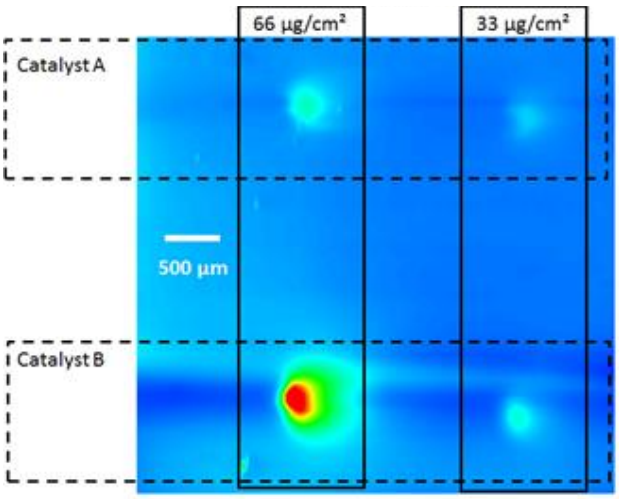

Figure: SECM image of 4 catalyst spots

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[1] D. Polcari, P. Dauphin-Ducharme and J. Mauzeroll. *Chem. Rev.*, 2016, 116, 13234− 13278.