ChemPubSoc Europe
DOI: 10.1002/celc.201901877
CHEMELECTROCHEM
Cover Profile

Enhancing Oxygen Reduction Reaction Catalytic Activity Using a Sub-Stoichiometric $CaTiO_{3-\delta}$ Additive


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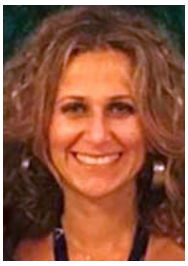
Maria Assunta Navarra

Invited for this month's cover picture is the group of Dr. Maria Assunta Navarra at the Chemistry Department of Sapienza University of Rome (Italy), in collaboration with CNR-ITAE and CNR-ISC. The cover picture shows a rotating disk electrode pinball where, thanks to the presence of the sub-stoichiometric calcium titanate perovskite, the oxygen reduction reaction is facilitated to proceed via the four-electron pathway. Read the full text of the Communication at 10.1002/celc.201901292.

What is the most significant result of this study?

Thanks to the use of a non-stoichiometric calcium titanate ($CaTiO_{3-\delta}$) perovskite as an additive of the Pt/C catalyst, the oxygen reduction reaction (ORR) in acidic media is more efficient presenting a four-electron reduction pathway and showing excellent electrochemical stability, associated with high corrosion resistance compared to the benchmark Pt/C catalyst. Moreover, the role of $CaTiO_{3-\delta}$ and its surface interactions appear advantageous to enhance both Pt catalyst activity and stability, owing to the presence of oxygen vacancies in the lattice of the perovskite.

Who designed the cover?

The cover has been designed by Giovanna Maresca and both perovskite structures presented in this communication (in the graphical abstract and the cover) have been realized by Graziano Di Donato. Both are experts on the use of computer art and young researchers of the ENAM (Electrochemistry and Nanotechnologies for Advanced Materials) group, coordinated by Dr. Maria Assunta Navarra at the Department of Chemistry of Sapienza, University of Rome.

What prompted you to investigate this topic?

For sustainable economic growth and environment protection, energies generated from renewable sources are indispensable. In this field, fuel cell technologies are considered as a key element in the future with clean energy becoming a suitable solution. One of the challenges to overcome, for the large-scale mass production of these devices, concerns the development of highly stable electrodes capable of efficiently catalyzing the ORR. At present, the most effective catalyst is Pt. However, its high price coupled with low durability and efficiency limit the practical application of the fuel cell technology. Therefore, the development of new materials with low cost and high efficiency for the ORR in acidic environment is necessary.