Electrolysis & Fuel Cell Discussions
Challenges towards zero platinum for oxygen reduction
13-16 September 2015,
La Grande Motte, France

Pt-Ni Porous Hollow Nanoparticles for Oxygen Reduction Reaction: Controlling the Nanoparticles Size and Dispersion.

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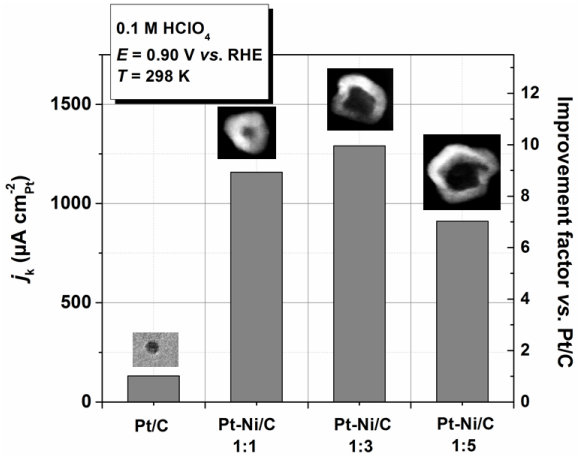
To be suitable for commercial applications, proton exchange membrane fuel cells - PEMFC - have to overcome several challenges, such as the cathodic limitations induced by the oxygen reduction reaction - ORR. Due to their high ORR mass activity, Pt-M (M = Ni, Co) nanostructured materials are interesting materials to electrocatalyze this reaction. Further enhancement in catalytic activity may be obtained by using carbon-supported porous and hollow nanoparticles [1]–[3] .

In this study, we describe our most recent findings on the synthesis and the catalytic properties of carbon-supported hollow porous Pt-Ni nanoparticles. Different parameters such as (i) the Pt:Ni stoichiometry, (ii) the chemical nature of the reducing agent ($NaBH_4$ or citrate), and (iii) the chemical and physical properties of the carbon support were used to control their morphological (Pt-rich shell thickness, size of the central cavity), structural (degree of contraction of the Pt lattice) and chemical properties [4]. The changes in ORR activity will be discussed in the light of these changes.



Changes of the ORR specific activity on porous hollow Pt-Ni/C nanoparticles with different structural and chemical properties. A 10-fold improvement is obtained over standard Pt/C nanocrystallites.

References

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