

ORR study of a Pt-free catalyst with RRDE, SECM and SECCM, from macro to nano scale measurements

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The hazardous pollution caused by burning of fossil fuels has put the well-being of the whole globe in jeopardy and yet they still account for 80% of energy production worldwide, generating the need for alternative energy sources. Electrochemical energy conversion devices are a promising option for green energy supply, although the challenge associated with electrocatalysis have caused increasing complexity in the materials and systems, demanding further research and insights. Electrocatalytic materials needed for key reactions in Fuel Cells such as Oxygen Reduction Reactions (ORR) are the main problematic in the field. The synthesis of noble-metal-free electrocatalysts is vastly encouraged, however the unambiguous determination of their electrocatalytic activity is just as crucial. In this work, we study a non-precious catalyst based on multi-walled carbon nanotubes (MWCNT) for its ORR activity, with macro, micro and nano scale laboratory techniques, respectively Rotating Ring Disc Electrode (RRDE), Scanning Electrochemical Microscopy (SECM) and Scanning Electrochemical Cell Microscopy (SECCM). Hence, unravelling crucial information about the catalyst and emphasizing the power of nano-scale single entity measurements.

Figures

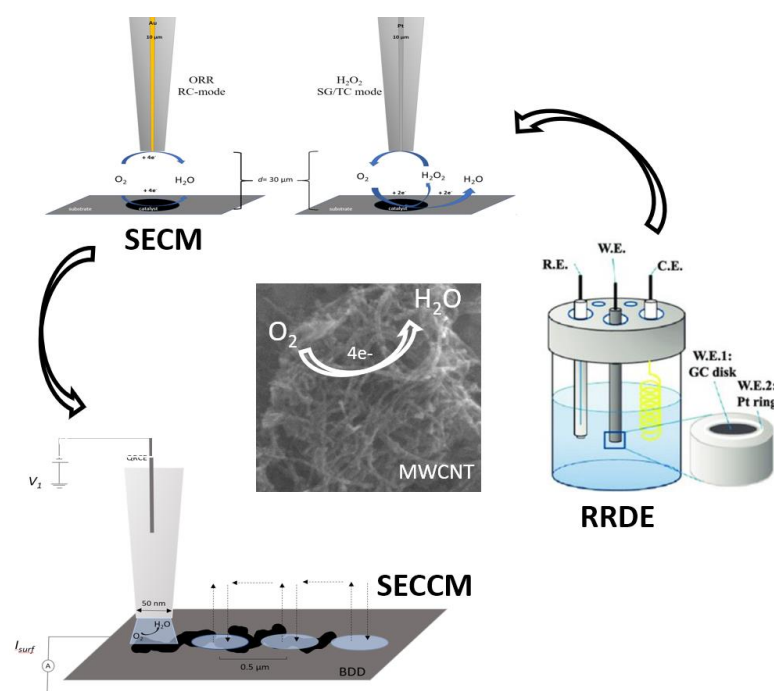


Figure 1: RRDE, SECM and SECCM investigation of a MWCNT-based catalyst for its ORR activity