

Carbon Blacks: A Broad Type of Carbon Materials with Different Electrocatalytic Activity to Produce H₂O₂

Authors : Alvaro Ramírez, Martín Muñoz-Morales, Ester L. Fernández, Javier Llanos

Abstract : Carbon blacks are value-added materials typically produced through the incomplete combustion or thermal decomposition of hydrocarbons. This material has been used as catalysts in many different applications, but in last decade it has been explored its potential in green chemistry applications. Among them, the electrochemical production of H₂O₂ has attracted many interests because of their properties as high oxidant capacity or their industrial interest as bleaching agent. Carbon blacks are commonly used in this application in a catalytic ink that it is drop-casted on supporting electrodes and act as catalysts for the electrochemical production of H₂O₂ through oxygen reduction reaction (ORR). However, according with the different structural and electrochemical behavior of each type, applications might be different. In this line the term 'carbon black', has to be considered as a generic name that do not guarantee any properties if any further description was mentioned. In fact, different specific surface area, surface functional groups, porous structure and electro catalysts effect seem very important for electrochemical applications and considerable differences were found during the analysis of four type of carbon blacks. Thus, the aim of this work is to study the evolution of main properties already mentioned to differentiate among some types of carbon blacks and the suitable ones for the ORR to produce H₂O₂ with improved selectivity and efficiency. Results indicate that number and size of porous is one of the key parameters but also the surface functional groups both highly related to the overall process efficiency.

Keywords : carbon blacks, oxygen reduction reaction, hydrogen peroxide, porosity, surface functional groups

Conference Title : ICWMRE 2024 : International Conference on Waste Management, Recycling and Environment

Conference Location : Quebec City, Canada

Conference Dates : July 15-16, 2024