

SILICA-TEMPLATED ORDERED MESOPOROUS N-DOPED CARBON THIN FILMS. A HIGHLY EFFICIENT CATALYST TOWARDS OXYGEN REDUCTION REACTION.

Javier Quílez-Bermejo¹, Emilia Morallón², Diego Cazorla-Amorós¹

¹Departamento de Química Inorgánica and Instituto de Materiales. Universidad de Alicante, Ap. 99, 03080, Alicante, Spain.

²Departamento de Química Física and Instituto de Materiales. Universidad de Alicante, Ap. 99, 03080, Alicante, Spain

Abstract

Metal-free catalysts are one of the most promising alternatives as cathodes for oxygen reduction reaction (ORR) in fuel cells and metal-air batteries. Among them, N-doped carbon materials are considered as a possible substitute for the commercial platinum-based catalysts used in these devices.

The most common preparation method of N-doped carbon materials consists on the heat treatment of a mixture of nitrogen and carbon-containing precursors. However, one of the main limitations of this method is that the pore structure and pore size distribution cannot be controlled.

Therefore, controlling the structure of the materials using a template arises as an important option to overcome this problem. In this study, we report a method to synthesize binderless ordered mesoporous N-doped carbon materials directly on a graphite current collector. The synthesis was done by electropolymerization and carbonization of a thin film of polyaniline grown on an ordered mesoporous silica thin film previously deposited on the graphite. This method produces an excellent catalyst for ORR due to the special combination of pore structure and catalytic active sites.