

Spin-selection control to improve the electrocatalysis for the oxygen reduction reaction in chiro-self-assembled FePc systems

Nayareth Vilches

Universidad de Santiago de Chile

Ricardo Venegas

Universidad de Santiago de Chile

Ana María Méndez

Universidad de Santiago de Chile

Rubén Oñate

Universidad de Santiago de Chile

Alexis Aspee

Universidad de Santiago de Chile

The spin-selection control to improve the Electrocatalysis for the water-splitting reactions has been demonstrated by R. Naaman et al. in different experimental platforms [1]. On the other hand, as the O₂ molecule is paramagnetic, the spin state of the electrons involved in the reduction process should be considered to improve the electrocatalytic performance of a specific electrodic surface. In this direction, iron phthalocyanine, FePc, is a molecular catalyst for ORR. It is an excellent building block to obtain electrocatalytic self-assembled systems anchored to electrode surfaces by the action of the molecular wires [1,2]. In these systems, the reduction electrons flow through this nano-circuit from the electrode surface and oxygen molecule binding to the active site (Fe-O₂). Since most electrocatalytic studies focus on the thermodynamic factor to improve the reaction (binding energies, potential redox, etc.), in this study, we have focused on the kinetic behavior involved in electron transport effects. To achieve this, we report the bottom-up self-assembly circuit construction based on a FePc-molecular catalyst for the ORR, anchored on a gold electrode surface by chiral peptide wires. The latter, Due to the electron transport in chiral peptides, exhibits the chirality-induced spin selectivity phenomenon (CISS), promoting the transport of one electron spin over the other in a chiral wire [4,5]. Our findings determine that the CISS effect influences the electrocatalytic action of FePc for ORR.

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