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Electrochemical Conversion of 5-Hydroxymethyl Furfural to 2,5-Furandi Carboxaldehyde using Mn(III)-Schiff Base Catalysts

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Biomass represents a major renewable carbon resource that can be used to produce fuels and bulk chemicals through manufacturing processes. 5-hydroxymethylfurfural (HMF) is one of the most promising biomass-based chemicals that has the potential to be converted to a variety of useful intermediates for polymers and many other fine chemicals. In this communication, we report the effective oxidation of HMF to 2,5-furandicarboxaldehyde (DFF) catalysed by two manganese(III)-Schiff base complexes in a pH 8.5, phosphate buffer at room temperature. DFF is a versatile precursor in the synthesis of functional polymers, pharmaceuticals, anti fungal agents and furan-urea resins.

Oxidations of HMF to DFF were performed under mild conditions using an Iso-tech laboratory DC power supply. Sodium chloride acts as electrolyte in order to increase the conductivity of water and to reduce the power dissipation. The electro catalytic reaction proceeds through the oxidation of chloride into hypochlorite at alkaline pH in a chlorine-free medium. Four manganese(III)-Schiff base complexes were tested, two of them behave as efficient catalysts in the oxidation of DFF to HMF with conversion rates of 70-80 %. The two active catalysts have a short carbon chain between imine groups, a feature that leads to tetragonally elongated octahedral geometries. An axial water molecule in this class of distorted geometries is quite a labile ligand the loss of which would generate a vacant position in the coordination sphere to accommodate the substrate molecule. On the other hand the two manganese(III)-Schiff base with flexible chain between the imine groups gave only 11% conversion to DFF.

Biography:

Lara Rouco received her BSc degree at University of Santiago de Compostela (2016) and her MSc degree at University of Granada (2017). She is currently doing her PhD in biomimetic catalysts at the Department of Inorganic Chemistry, University de Santiago de Compostela. She has authored five scientific publications related to her area of expertise.