CHARACTERIZATION OF A SULFATED POLYSACCHARIDE FROM MARINE SEAWEED AND ITS POTENTIAL ROLE AS AN ELECTRODE MODIFIER

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The porphyrans are polysaccharides extracted from red algae, recognized for their pharmacological properties. Their structure is composed by sulfated galactose units. Since there are many charged groups attached on the sugar chain, porphyrans can be applied as electrode modifiers, improving the performance of these devices in sensing applications. This work describes the characterization of a porphyran (PFR) extracted from \textit{Porphyra} seaweed and its use to prepare glassy carbon paste modified electrodes (GCPE/PFR). The polysaccharide was extracted with water (60 °C) and characterized by FTIR, \textsuperscript{13}C NMR and dynamic light scattering (DLS). Its chemical composition was determined by total sugar and \textsuperscript{4}SO\textsubscript{4}\textsuperscript{2-} contents. The GCPE/PFR was prepared by mixing glassy carbon powder (79.2 mg) with PFR (80 μL of a 10 mg mL\textsuperscript{-1} solution) and mineral oil (30 μL). The composite was packed into a Teflon\textsuperscript{®} tube. The electrochemical measurements were performed using a potentiostat/galvanostat AutoLab, in an electrochemical cell containing bare or GCPE/PFR as working electrode, Pt wire as auxiliary and Ag/AgCl as reference. The extracted PFR contained 12.0% and 86.0% of sulfate and total sugar, respectively. The size distribution obtained by DLS showed that 94.1% of PFR particles had 964.8 nm. Typical signals for the PFR were observed in FTIR analysis, including at 3430 (ν O-H), 1256 (ν SO\textsuperscript{4}\textsuperscript{2-}), 1421 (δ C-O-H) and 1073 cm\textsuperscript{-1} (ν C-O-C). The \textsuperscript{13}C NMR spectrum showed signals at 103.49, 102.19, 101.25, 98.21 and 69.95 ppm, which confirmed the polysaccharide structure. Cyclic voltammograms in ferrocianide ions showed higher current values for the GCPE/PFR compared to the unmodified GCPE (I\textsubscript{pa,GCPE}: 200.40 μA; I\textsubscript{pa,GCPE/PFR}: 295.10 μA). Moreover, the charge transfer resistance obtained for the GCPE/PFR in the impedance spectra was lower (EPCV: 887,0 Ω; EPCV/PFR: 290,73 Ω). These results suggest that the PFR improved the electrochemical properties of the electrodes, allowing their application in sensing purposes.

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\textbf{Key words:} porphyran, electrode, voltammetry.