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Preparation and Characterization of Nanostructured FeN Electrocatalyst for Air Cathode Microbial Fuel Cell (MFC)

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Abstract : The present work represents a preparation of non-precious iron-based electrocatalyst (FeN) for ORR in air-cathode microbial fuel cell by pyrolysis treatment. Iron oxalate which recovered from the industrial wastewater and Phenanthroline (Phen) were used as the iron and nitrogen precursors, respectively in preparing FeN catalyst. The performance of as prepared catalyst (FeN) was investigated in a single chambered air cathode MFC in which anaerobic sludge was used as inoculum and palm oil mill effluent as substrate. The maximum open circuit potential (OCV) and the highest power density recorded were 0.543 V and 4.9 mW/m2, respectively. Physical characterization of FeN was elucidated by using Brunauner Emmett Teller (BET), X-Ray Diffraction (XRD) analysis and Field Emission Scanning Electron Microscopy (FESEM) while the electrochemical properties were characterized by cyclic voltammetry (CV) analysis. The presence of biofilm on anode surface was examined using FESEM and confirmed using Infrared Spectroscopy and Thermogravimetric Analysis. The findings of this study demonstrated that FeN is electrochemically active and further modification is needed to increase the ORR catalytic activity.

Keywords : iron based catalyst, microbial fuel cells, oxygen reduction reaction, palm oil mill effluent
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