Platinum is well known to exhibit superior catalytic effect on oxygen reduction reaction (ORR) but, slow reaction kinetics and the cost of bulk platinum limits the application [1]. Alternatively, platinum nanoparticles deposited on the electrode surfaces have displayed greater catalytic activity more than bulk deposits of platinum. These nanoparticles are usually deposited on a polymeric coating or metal oxides for preventing agglomeration. Manganese oxide (MnO_x) has been widely used in a number of electrocatalytic applications and can be prepared in mixed valent form. Their performance is strongly depends on their morphology, particle size, composition, and crystal structure. Electrochemical deposition provides a low cost alternative for producing such deposits as a thin film by simply controlling the potential range and scan rate. Electrocatalytic performance of the electrode can be further enhanced by decorating Pt nanoparticles on the manganese oxide coating [2]. Resulting binary catalyst, i.e. Pt–MnO_x/GCE electrode, can catalyze the direct oxidation process of formic acid.

Present study reports the use of a glassy carbon electrode modified with manganese oxide decorated with platinum nanoparticles (Pt–MnO_x/GCE) for electrocatalytic reduction of oxygen dissolved in buffer solution. The electrode exhibits better electrocatalytic activity toward oxygen reduction than bulk platinum due to larger surface area of manganese oxide which also prevents agglomeration of platinum nanoparticles. Best results were obtained with the electrode modified by cycling the potential in a range of −0.25–1.05 V for five times in a cell containing 1.0 mM K_2PtCl_6 and 0.1 M MnSO_4 in 0.01 M H_2SO_4 solution. Then, the electrode developed was utilized as a biosensing platform for the monitoring of oxygen consumption due to the biocatalytic activity of pyranose oxidase.

In the pursuit of a stable and rapid response the biocomponent was bridged with an ionic liquid namely 1-butyl-3-methyl imidazolium hexafluorophosphate. Chronoamperometric measurement of oxygen at 0.2 V gave 0.010–0.100 mM linear range with a detection limit of 2.0 µM and sensitivity of 6.1 nA M^{-1} under optimized conditions. In addition, ionic liquid provides a conductive environment which shortens the response time to 3 s for low concentrations. Overall results indicated that fabricated biosensor is a good candidate for automated systems.

**KEYWORDS:** Metal–metal oxide electrodes, Ionic liquid, Glucose biosensors, Catalytic oxygen reduction

**REFERENCES:**