

Development of novel polymer electrocatalysts towards solving challenging environmental pollution phenomena

Priscilla G L Baker ^a and Pierre-Henri Aubert ^b

(a) SensorLab, Chemistry department, University of the Western Cape, PB X 17, Bellville, South Africa

(b) LPPI, Department of Chemistry, University Cergy Pontoise, 5 Mail Gay Lussac, 95031 Cergy Pontoise Cedex

Part I: Development of novel electrocatalysts

Conductive and semi-conductive polymers may be readily prepared from simple organic monomers in aqueous solutions using electrochemical polymerisation. Electrochemical polymerisation is uniquely capable of producing nanopolymers in situ in real time. Polymer composites with unique chemical and physical properties compared to that of the original parent polymer may be achieved in many ways including electrochemical polymerisation from a solution containing a mixture of monomers, chemical condensation reaction to functionalise or cross link short polymer chains and thus produce novel monomers for electropolymerisation as well as modification of the parent polymer by doping with metal nanoparticles, during electrochemical synthesis. The main objective being to produce semi conductive transducer platforms with unique electrochemistry that may be tailored to separate compounds in a family that are structurally closely related such as polycyclic aromatic hydrocarbons. In addition electrochemistry is a green technology, using small amounts of chemicals at a time and generating very little waste. Simplified instrumental configurations are required and many small electrochemical analysers i.e. PalmSens (USA) and Orignalys (France) are available on the market for portable applications

Outcomes:

- (i) Synthesis and characterisation of novel polymer composites through in situ electro-polymerisation of polypyrrole, polyamic acid acid, polysulfone and graphene oxide
- (ii) Synthesis and characterisation of polymer nanocomposites through chemical condensation reaction to produce functionalised and crosslinked polymer composites;
- (iii) Synthesis and characterisation of metal nanoparticle modified polymer nanocomposites for enhanced catalytic effect.