

1. Overview

The research exchange visit to the University of Missouri (Columbia) represented the first steps towards a mutually beneficial research collaboration between the electrochemistry driven research focus of SensorLab (UWC) and the engineering expertise offered by the College of Engineering (Columbia, Missouri). SensorLab researchers introduced the polymer material extensively studied in their laboratories (UWC) as a suitable material for electrospinning. Preliminary testing and optimization of spinning conditions was done in South Africa, but the expertise and engineering focus of the Missouri team was required to produce high quality room temperature stable nanofibers of polyamic acid. Furthermore the technical expertise of Prof David Grant (Engineering) with respect to custom made electrospinning experiments delivered very high quality stand alone films of polyamic acid nanofibers. These nanofibers were further subjected to molecular imprinting of atrazine (test molecule) during the spinning step with great success.

2. Proposed Objectives (*abbreviated*)

The original objectives proposed for the 2018 visit (UWC to UM) were based on introduction of research focus areas and partners as well as exploring research areas of mutual interest, with short term outcomes in mind:

Objective 3:

Objective 2:

Siyabulela Hamnca was able to successfully reproduce the synthesis of polyamic acid and do the necessary characterization by FTIR and cyclic voltammetry to confirm the integrity of the synthesized polymer. Most of the other student in the Grant group at the time were already fully engaged in their own research activities and whilst none of them particularly needed to work in the area of polymer electrochemistry at the time of the visit, most of the learning and sharing took place as peer group learning in the group presentations. The students of the Grant group were very helpful and accommodating in facilitating the research activities of Mr Hamnca and the collaboration was a good networking experience, both in the lab as well as socially.

Objective 3:

Prof Dave Grant was key in fine tuning the electrospinning parameters of the custom made electrospinning facility in their research lab. The hands on approach and ability to tailor make the system, to the requirements of polyamic acid spinning was both a luxury and a very novel experience for us. In South Africa we were only able to spin on commercial instruments which presented a number of restrictions, resulting in partial efficiency of spinning and materials with a high degree of beading. Great success was achieved with spinning high quality polyamic acid nanofibers and the characterization of the polymer nanofibers. Moreover, stable films of polyamic acid that could be peeled off the collector plate was prepared. Since polyamic acid is a polymer with very good semiconductor behavior (previous work from SensorLab) this was a very promising materials

Figure 1: Conceptual diagram of immunosensor design based on electrospun polymer nanofibers

The proposal expanded on the in situ deposition of electrospun polyamic nanofibers (i) molecularly

4. Additional Noteworthy Activities

4.1 Scientific

Prof Baker was also invited on an extensive Chemistry department tour hosted by Prof Benschoeetter. Prof Baker met with Prof Tim Glass (head of department, Chemistry) and elaborated on their mutual interest in electrochemistry research. Prof Baker also shared a presentation (PDF) with Prof Glass as a first line for information, should there be interest from colleagues in Chemistry department (UM) to collaborate with colleagues Chemistry (UWC). Prof Baker and Glass also deliberated on the management system and leadership skills relevant to leading a successful academic and research proactive department. Prof Benschoeeter (an Inorganic Chemist) also delighted in sharing the professional skills, equipment and infrastructural highlights of the UM Chemistry department. The departmental site visit was concluded with a campus walkabout and a visit to the University Faculty recreational facility; a truly memorable culinary experience.

4.2 Integration and Logistics:

Prof Baker and Mr Hamnca were accommodated on the main campus in Excellence Hall and enjoyed