Staff exchange Report
Visit to the Centre of Textile Science & Engineering, Ghent University, Belgium
(March - 20th - 10th April 2018)

Dr. S. A. Odhiambo
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1.1 Introduction
I wish to thank the ACE II PTRE project for supporting my staff exchange to Ugent, centre of Textile Science & Engineering, Ghent University Belgium.

During my visit we managed to achieve most of the objectives set but not within the expected time limit. The time applied for exchange program was too short, and there was a need to extend the stay in order to obtain tangible results.

2.0 Planned activities
The planned activities during the staff exchange were:

- Conduct the validation experiments on the mechanism of power storage in the developed textile based energy storage devices, and study the limits and possibilities of the devices.

- Enhance the draft manuscript based on the results from the validation experiments and submit the Manuscript.

- Work on Erasmus project proposal together with Professor Van Langenhove and other potential collaborators, then submit.

- Discuss with Professor Van Langenhove on future collaborations:
  - Her visit to the south under ACE II PTRE project and
  - How to assist us in future with student research experiments that we are not able to carry out in our laboratory in Kenya.

3.0 Actual Outputs

3.1 Validation experiments
The experiments were based on continuation of research topic on Textile based energy storage devices for smart textile application. In this work functional energy storage devices well integrated into textiles were developed using a three layered porous laminate of textile fabric made of polyester/cotton with three conductive yarn electrodes (stainless steel yarns). Poly-(3, 4-ethylene dioxythiophene):poly(styrene
sulfonate)(PEDOT:PSS), which is a conducting polymer, was used as the electrolyte. The steps involved in developing the devices are shown in Figure 1 below.

The validation experiments were conducted by Parstat, advanced electrochemical system and NI-PXI 1033 equipment from national instruments. This equipment were used in charge-discharge experiments and quantifying the amount of energy stored in the devices at ambient conditions. Figure 2 shows myself analyzing the devices after the insertion of conductive yarns and before application of PEDOT:PSS, in one of the labs (physical lab).
The results obtained from the validation experiments were used to beef up the manuscript.

“The electric energy stored in PEDOT:PSS capacitors integrated on textile substrate: limits and possibilities” submitted to International journal of clothing science and technology a peer reviewed journal.

Concurrent to this, we have also submitted a second manuscript: “Mathematical model predicting the heat and power dissipated in an electro-conductive contact in a hybrid woven fabric” to Autex research journal which is also a peer reviewed journal.

3.2 Manuscripts output:

The two have been submitted, thanks to the support from ACE Project to enable me travel to UGent and do the necessary before the submissions.
1. The electric energy stored in PEDOT:PSS capacitors integrated on textile substrate: limits and possibilities

by S. A. Odhiambo¹,², P. Fiszer³,⁴, G. De Mey⁴, C. Hertleer¹, I. Nuramdhani¹,⁵, L. Van Langenhove¹ and A. Napieralski³

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2. MATHEMATICAL MODEL PREDICTING THE HEAT AND POWER DISSIPATED IN AN ELECTRO-CONDUCTIVE CONTACT IN A HYBRID WOVEN FABRIC.

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I am confident that in the coming weeks at least one of the manuscripts will be accessed online if not both.

3.3 Research proposal.

After conducting the validation experiments and obtaining useful results, I was requested to apply for CWO (Faculty of Engineering and architecture internal funds for a staff exchange of 6 months) (see attached). The CWO application is a short one
to the faculty of Engineering and architecture through my Professor Vanlangenhove and was submitted by May 1, 2018.

If this Application is successful, it will foresee further work within the research topic on the Textile based energy storage device and also in the time, we plan to apply for the EU horizon 2020 call for projects proposals “Marie Slowdoska Curie” under the topic, *innovative training networks* as a back up to the application on our E-team erasmus project.

There are other 2 group project proposals that I barely got time to look into details, but thanks to our continuing collaboration with the department of materials and Textile and chemical Engineering, as another colleague from MIT department Moi University, Professor Githaiga is working on them closely with Professor Vanlangenhove and other members within the group.

It was not easy for Professor Vanlangenhove to fix a staff exchange visit to the south within the coming few months, as she is very busy and her agenda is full, but she promises she will look into the possibility of doing so next year.

4.0 Remarks

Once more, I sincerely want to thank ACE II PTRE Project for granting me the opportunity for the 2 weeks staff exchange programmes as it has opened other windows for further collaboration, and further capacity building of myself and others, that will benefit from the proposed projects, if the applications are successful.

Date: ..........................07/05/2018....

Signed.........