

1st SAIEE Conference

Functional Printing for a Future Africa

Suzanne Smith, Kevin Land and Trudi Joubert

Make today matter

28 November 2019



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

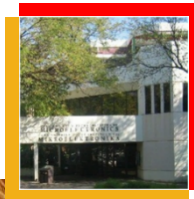
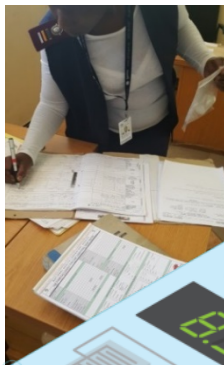
Faculty of Engineering,
Built Environment and
Information Technology

Fakulteit Ingenieurswese, Bou-omgewing en
Inligtingtegnologie / Lefapha la Boetšenere,
Tikologo ya Kago le Theknolotši ya Tshedimošo



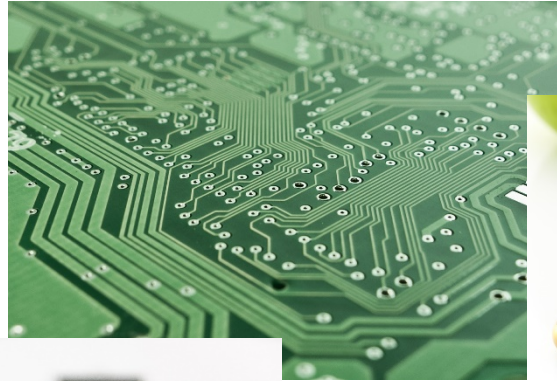
Carl and Emily Fuchs Institute for Microelectronics (CEFIM),
Department of Electrical, Electronic and Computer Engineering

Overview



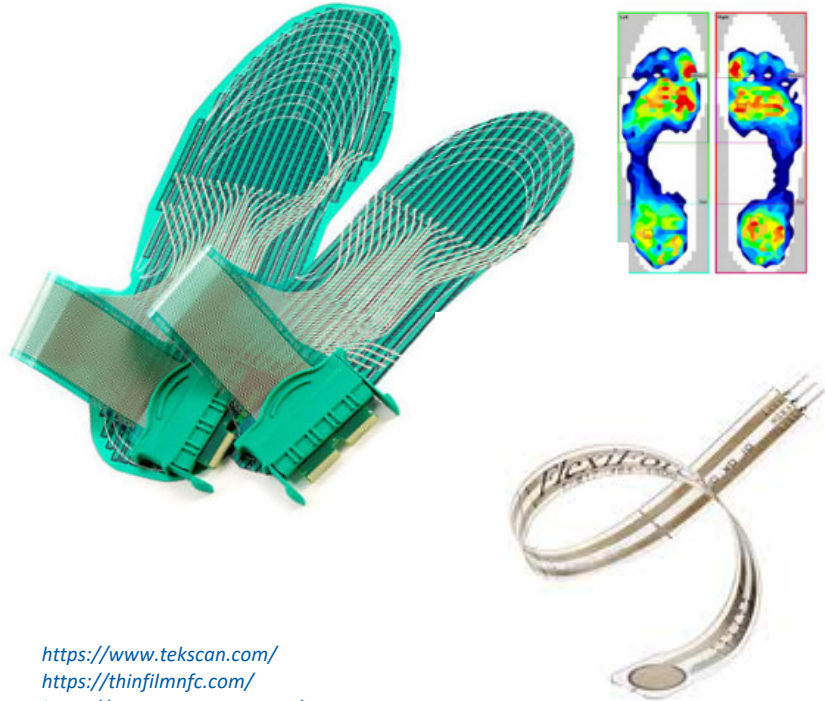
Smith et al., RSC Adv., 2018, 8, 34012-34034. DOI: 10.1039/C8RA06132G
Photo credit: S. Smith
<https://www.pexels.com/>

Background

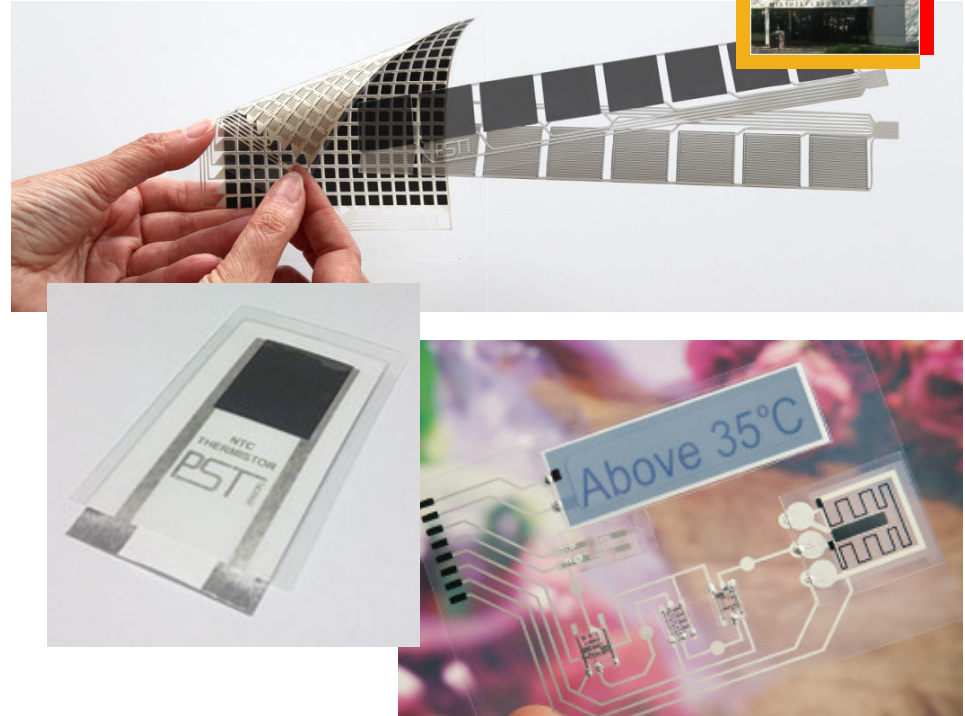


<https://pixabay.com/>

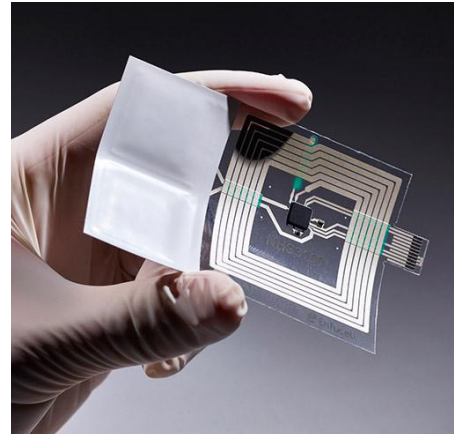
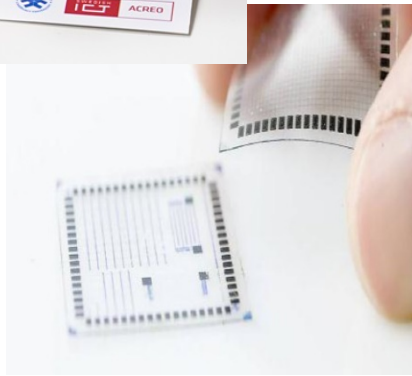
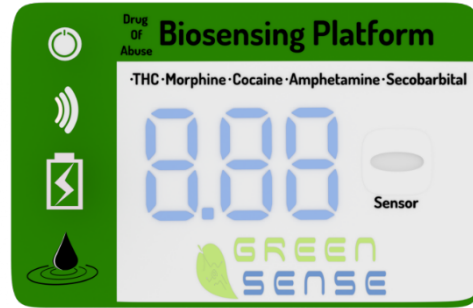
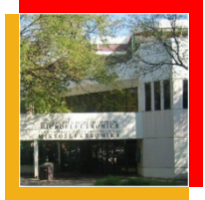
Printed electronics



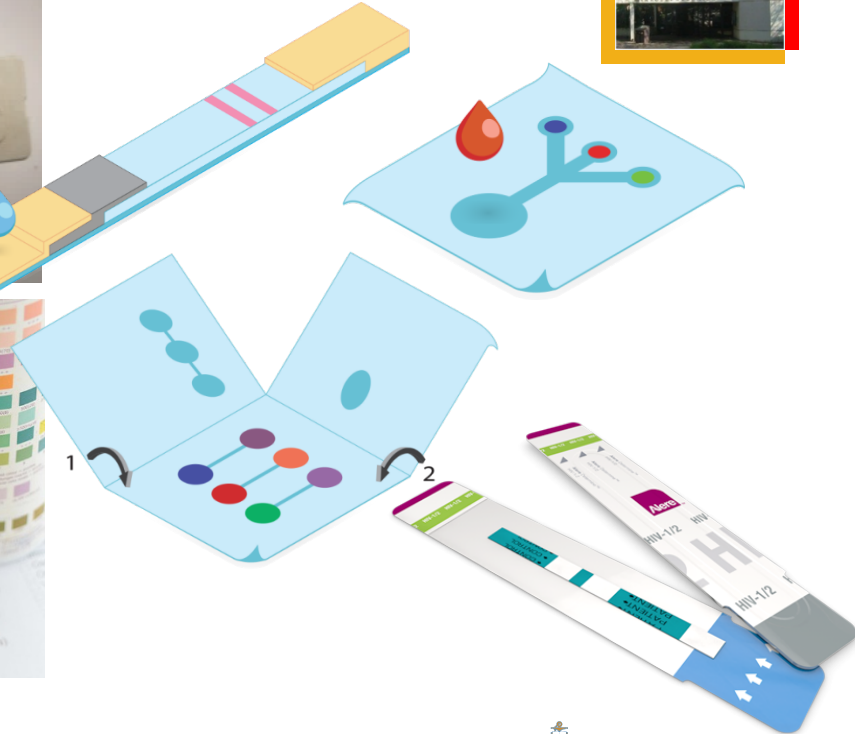
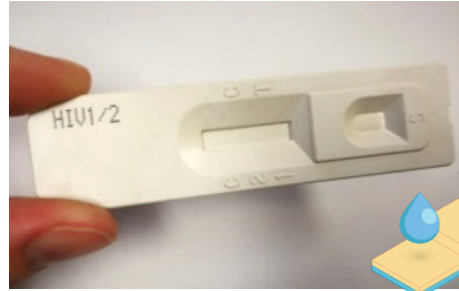
<https://www.tekscan.com/>
<https://thinfilmnfc.com/>
<https://www.pstsensors.com/>



Printed electronics

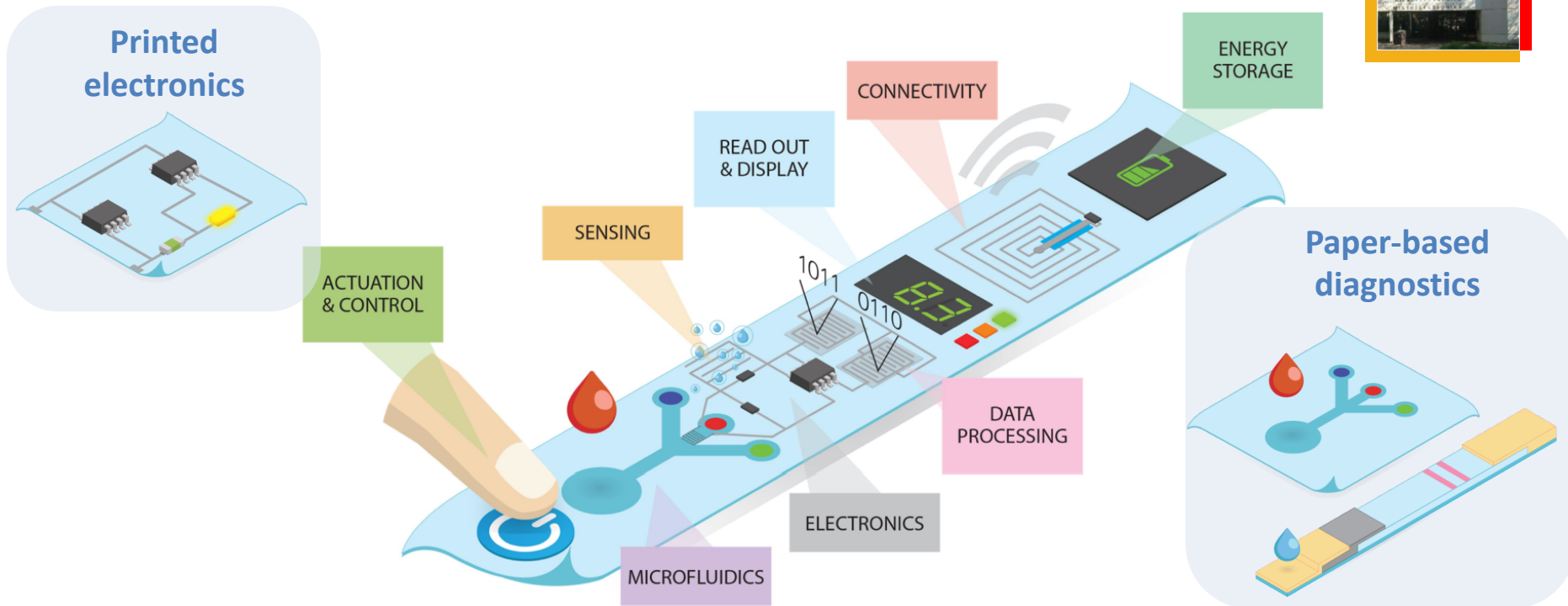
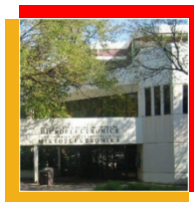


<https://www.acreo.se>
<https://www.vtresearch.com/>
<https://thinfilmnfc.com/>
<https://www.enfucell.com/>



6

Printed functionality

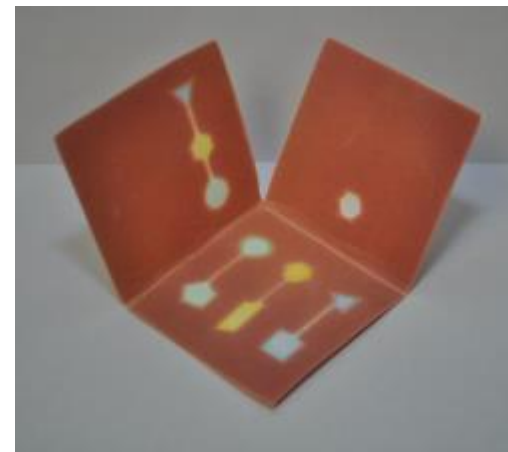
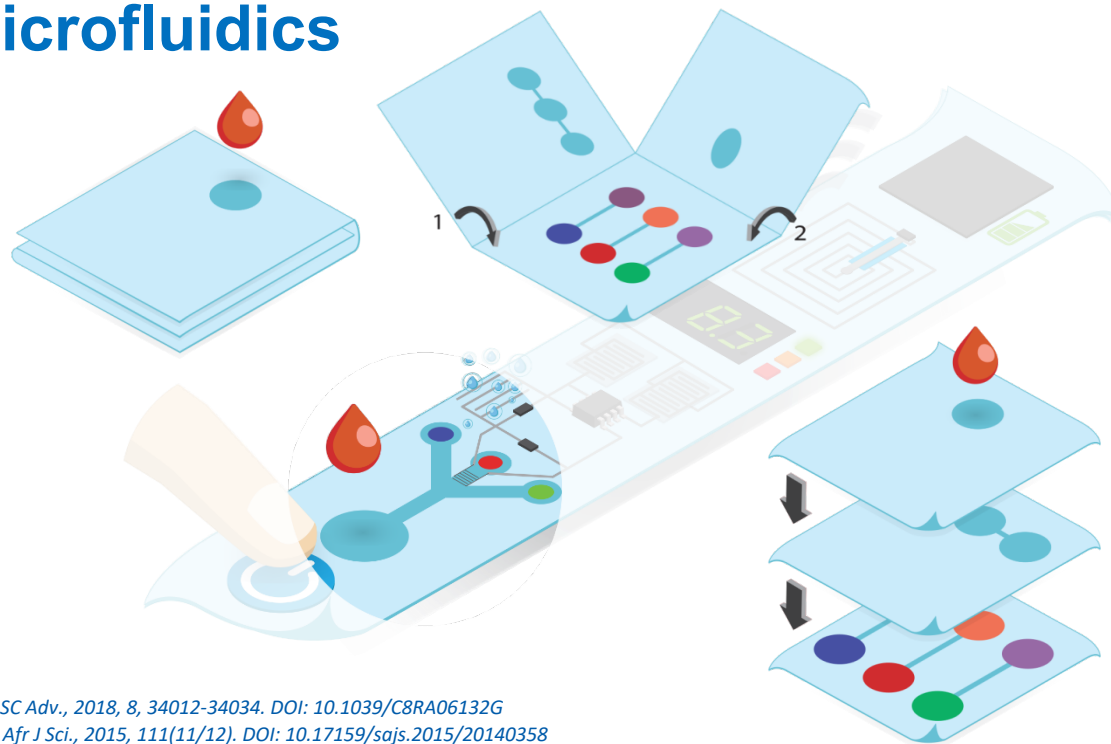
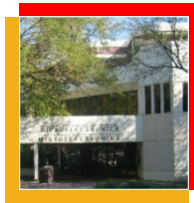


Smith et al., RSC Adv., 2018, 8, 34012-34034. DOI: 10.1039/C8RA06132G



Printed components

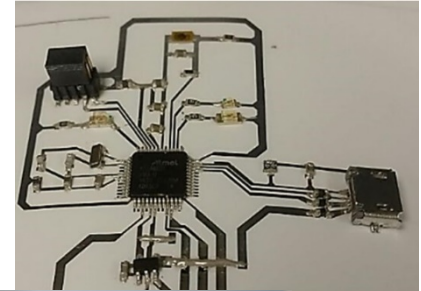
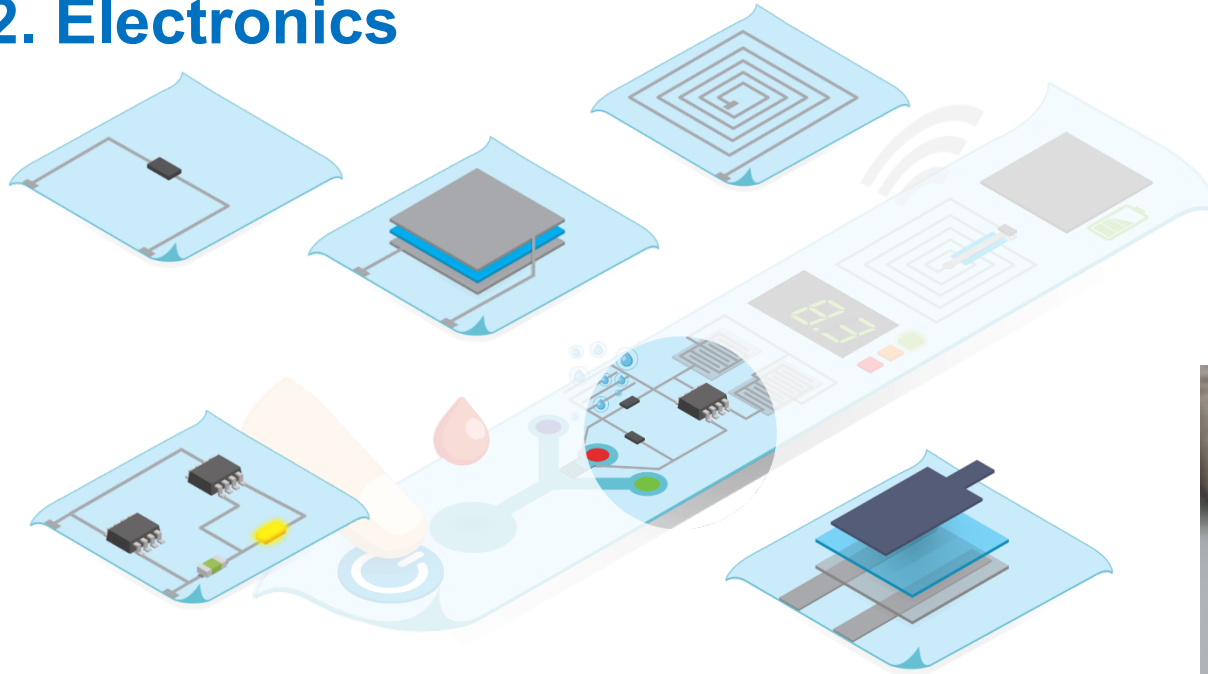
1. Microfluidics



Smith et al., *RSC Adv.*, 2018, 8, 34012-34034. DOI: 10.1039/C8RA06132G
Smith et al., *S Afr J Sci.*, 2015, 111(11/12). DOI: 10.17159/sajs.2015/20140358

Printed components

2. Electronics

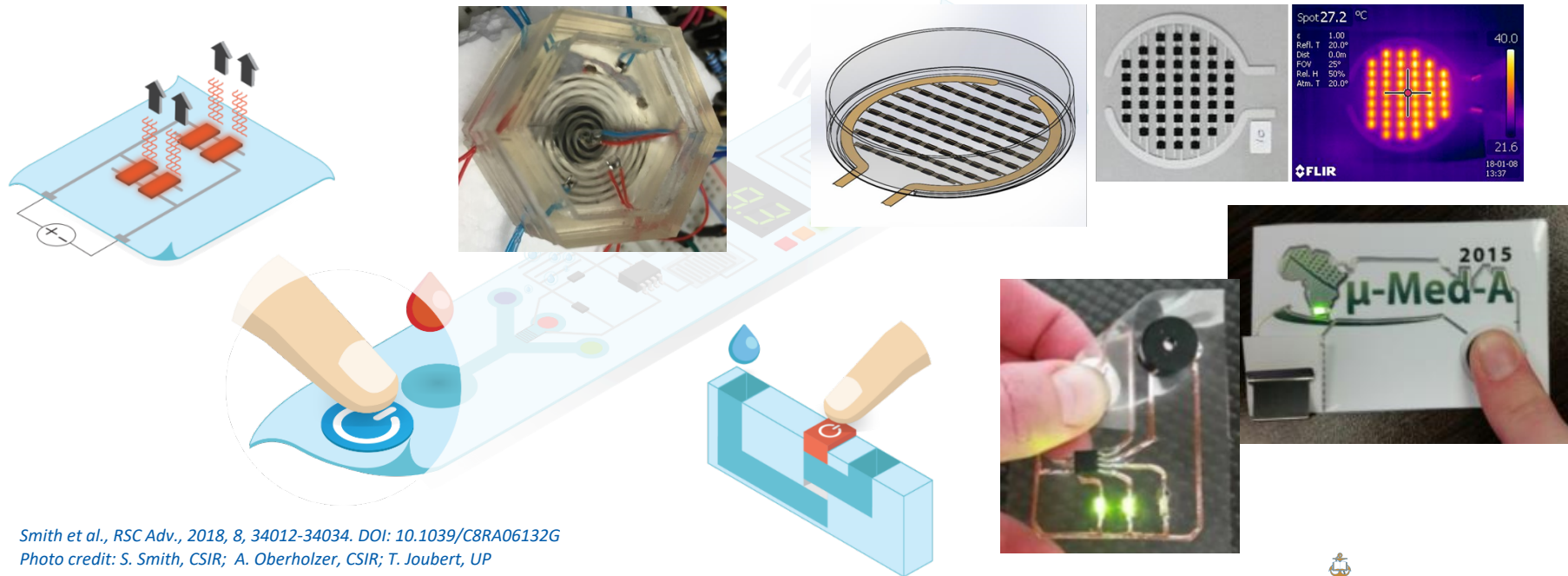
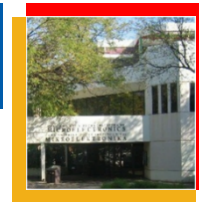


Smith et al., RSC Adv., 2018, 8, 34012-34034. DOI: 10.1039/C8RA06132G

Photo credit: P. Bezuidenhout, CSIR

Printed components

3. Actuation and control

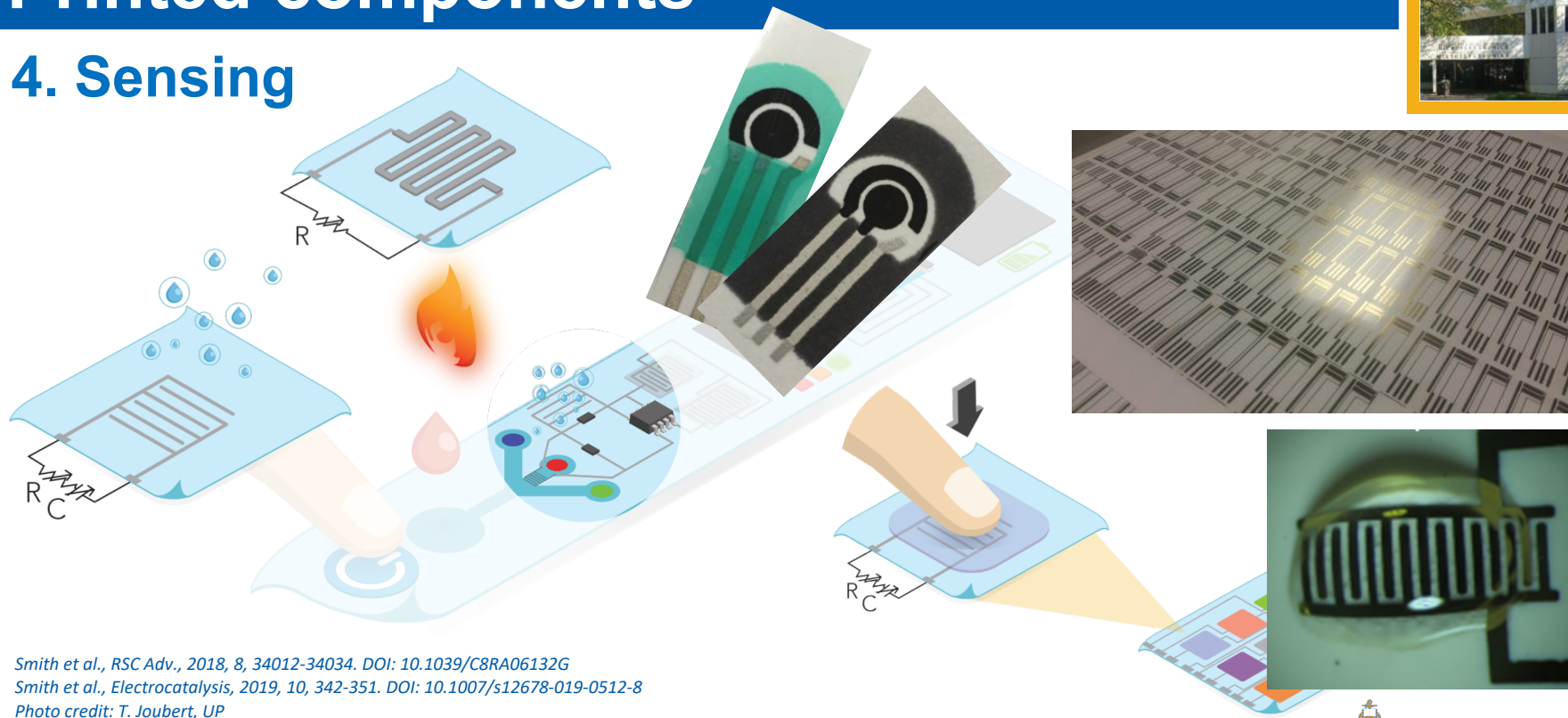


Smith et al., RSC Adv., 2018, 8, 34012-34034. DOI: 10.1039/C8RA06132G

Photo credit: S. Smith, CSIR; A. Oberholzer, CSIR; T. Joubert, UP

Printed components

4. Sensing



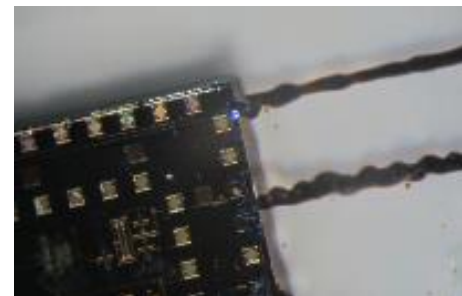
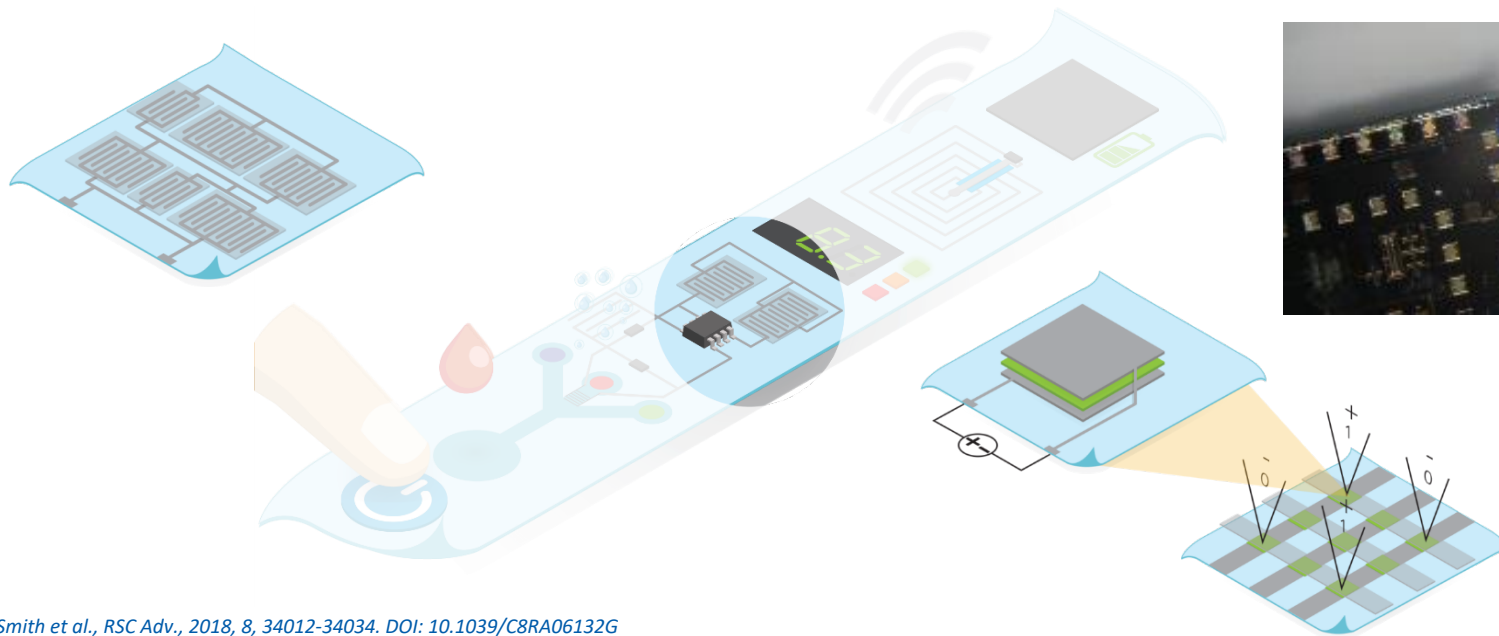
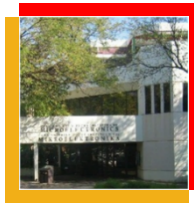
Smith et al., *RSC Adv.*, 2018, 8, 34012-34034. DOI: 10.1039/C8RA06132G

Smith et al., *Electrocatalysis*, 2019, 10, 342-351. DOI: 10.1007/s12678-019-0512-8

Photo credit: T. Joubert, UP

Printed components

5. Data processing

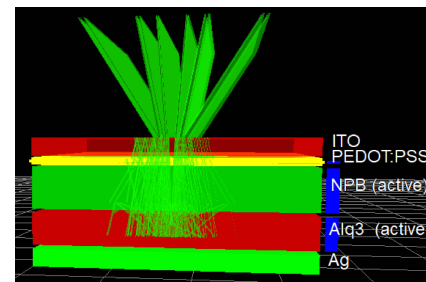
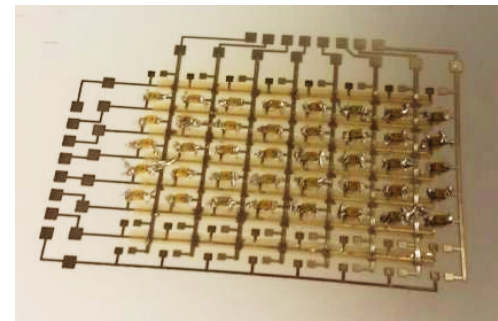
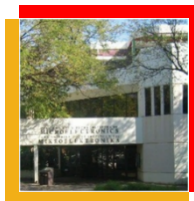


Smith et al., RSC Adv., 2018, 8, 34012-34034. DOI: 10.1039/C8RA06132G

Photo credit: T. Joubert, UP

Printed components

6. Readout and display

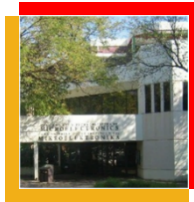


Smith et al., RSC Adv., 2018, 8, 34012-34034. DOI: 10.1039/C8RA06132G

Photo credits: S. Smith, CSIR; T. Joubert, UP

Printed components

7. Connectivity



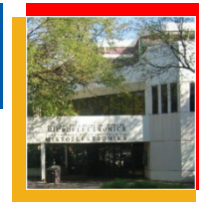
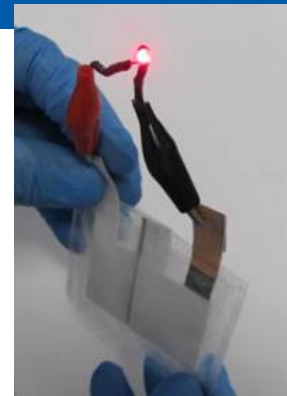
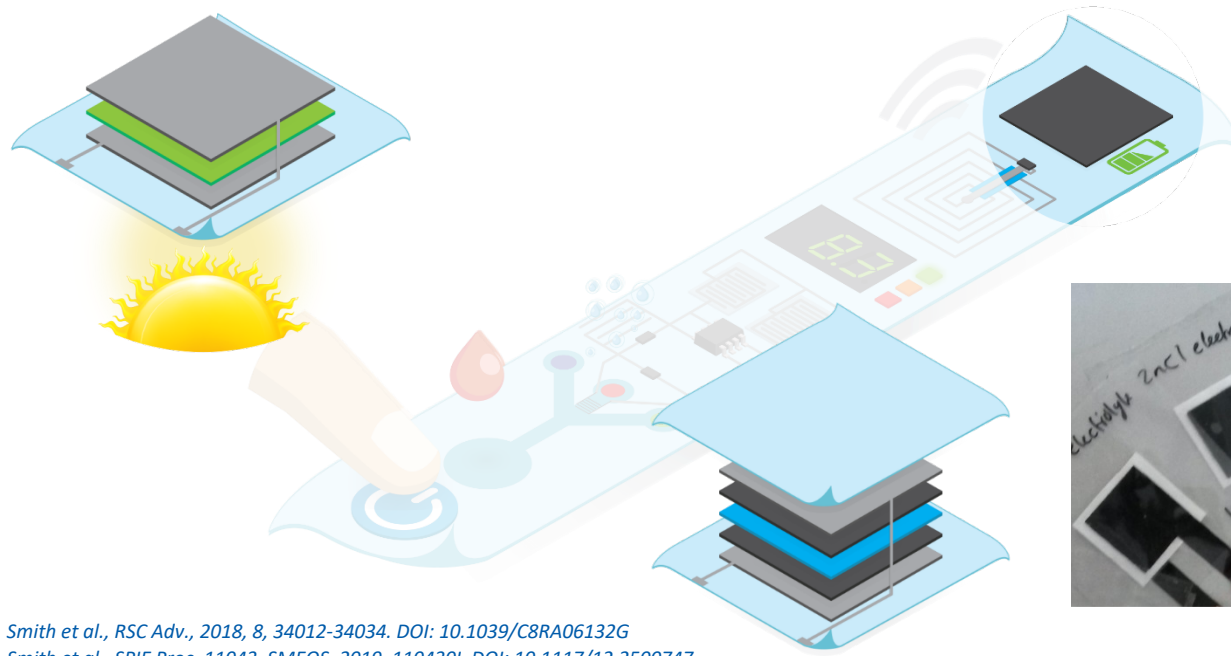
Smith et al., RSC Adv., 2018, 8, 34012-34034. DOI: 10.1039/C8RA06132G

Smith et al., RAPDASA conference, 2017

Smith et al., IOP FPE, 2018, 3, 025002. DOI: 10.1088/2058-8585/aabc8c

Printed components

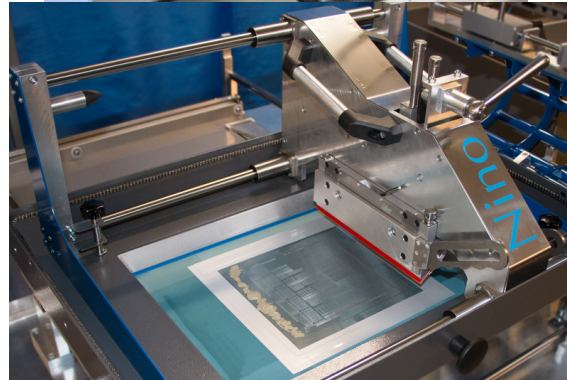
8. Energy storage



Smith et al., RSC Adv., 2018, 8, 34012-34034. DOI: 10.1039/C8RA06132G

Smith et al., SPIE Proc. 11043, SMEOS, 2019, 110430I. DOI: 10.1117/12.2500747

Manufacturing



<https://www.coruna.ch/>

<https://www.optomec.com/>

Smith et al., S Afr J Sci., 2015, 111(11/12). DOI: 10.17159/sajs.2015/20140358

Characterisation

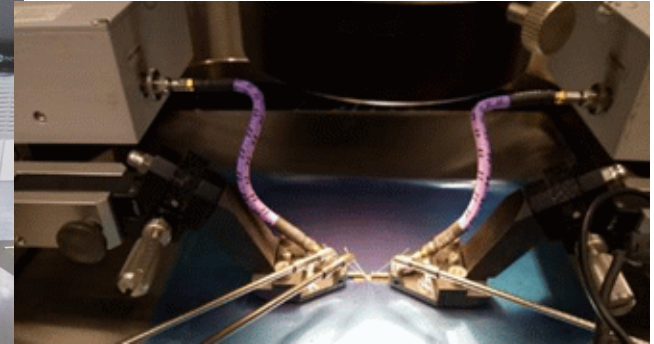
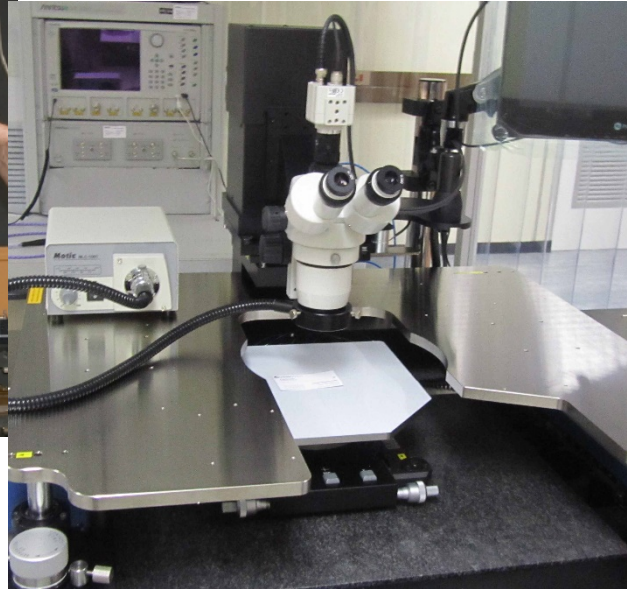
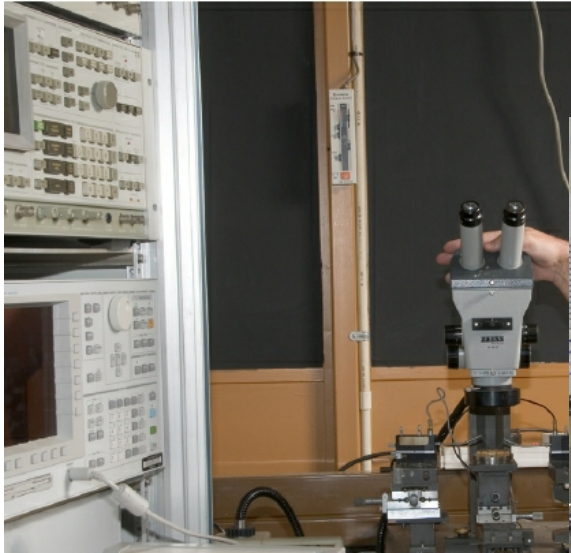
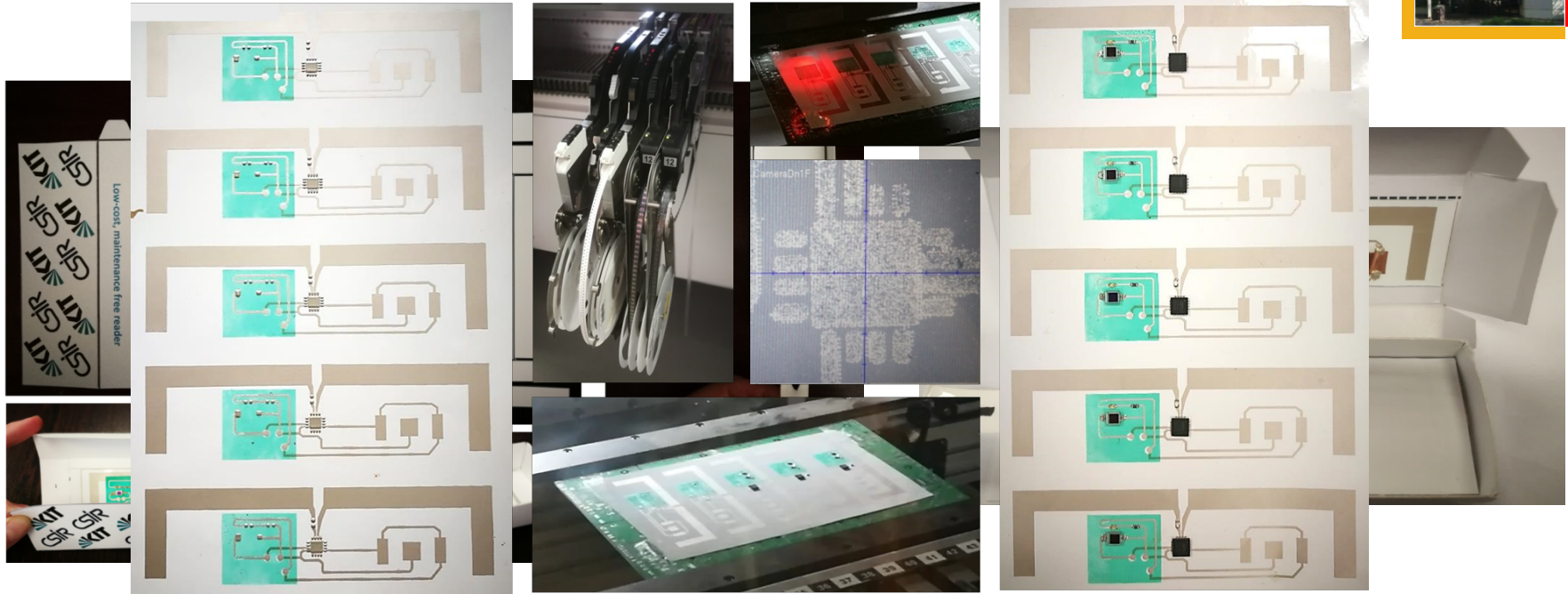


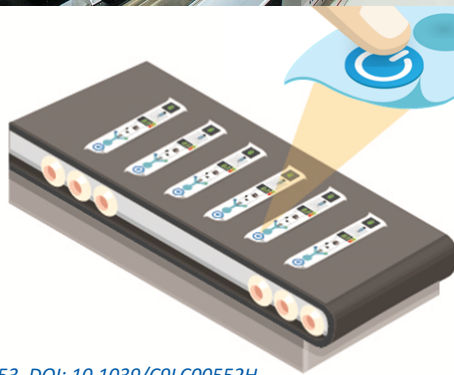
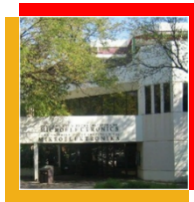
Photo credit: T. Joubert, UP

Packaging and scalability



Smith et al., Lab on a Chip, 2019, 19, 3344-3353. DOI: 10.1039/C9LC00552H

Taking it further...



<https://www.vttresearch.com/>

<https://www.innovationlab.de/>

Smith et al., Lab on a Chip, 2019, 19, 3344-3353. DOI: 10.1039/C9LC00552H



The plan

- DSI SARIR
- NMMF – Nano-Micro Manufacturing Facility



<https://www.sanmma.org.za/>



Examples towards the goal



Bezuidenhout et al., RAPDASA conference, 2017.

<https://pixabay.com/>

Smith et al., Lab on a Chip, 2019, 19, 3344-3353. DOI: 10.1039/C9LC00552H

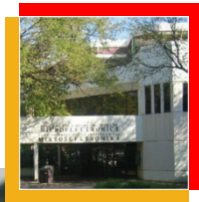


Industry collaboration



<https://www.touchsystems.co.za/>
<https://didget.co.za/>
<https://www.rfid.co.za/>

Local solutions for local challenges



Thank You

