

Printed tools for robotized testing of electrochemical sensors

Mats Sandberg

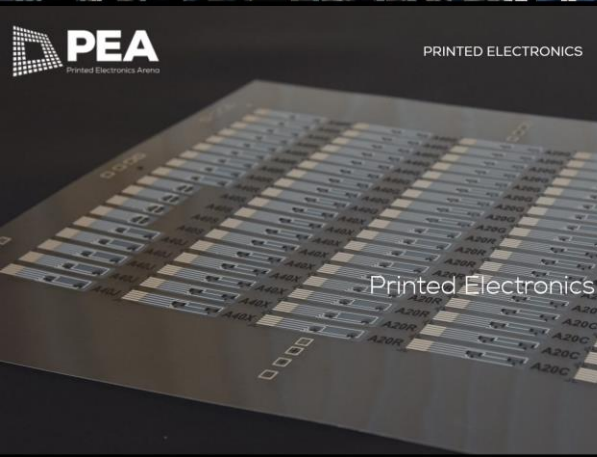
**RISE Bio- and Organic, Printed Electronics
Mistra TerraClean**

RISE, Printed Electronics, Norrköping



Development and prototyping of

- Displays
- Transistors
- Silicon-printed hybrids
- Sensors
- Materials for this

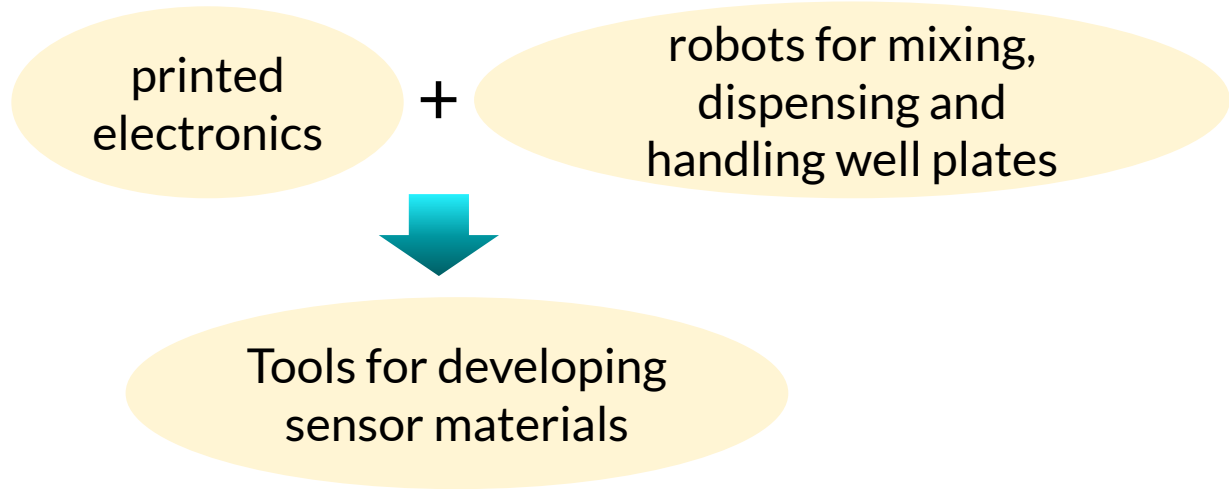


Printed tools for robotized materials testing

<https://www.printedelectronicsarena.com>

What to expect from this presentation:

Concept:



(A methodology approach in sensor development rather than sensors as such)

Trend in materials science and chemistry:

Robotization of laboratories



Drivers:

Reduce tedious lab work

Digitally supported development

Mistra TerraClean needs:

High throughput testing of sensors



Mistra TerraClean develops smart and safe
engineered materials and devices for clean
air and water

mistraterraclean.com

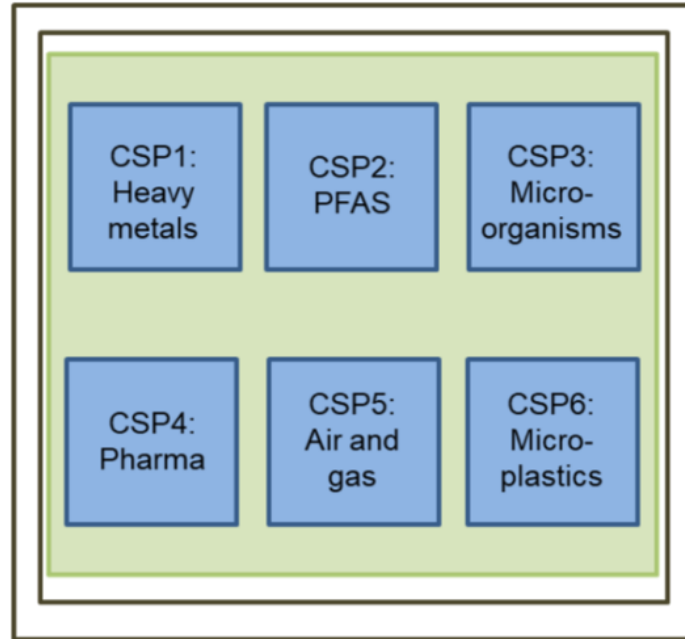
**ALFA LAVAL ASTRAZENECA AVANZARE BOLIDEN
BRIGHT DAY GRAPHENE CAMFIL AB HUMLEGÅRDEN
IKEM INSPLOSION IVL LOVISAGRUVAN AB
MIMBLY NORDIC WATER RADMA CARBON AB RISE
ROYAL INSTITUTE OF TECHNOLOGY (KTH) SAAB
SALLY R SGU SKF SLU STOCKHOLM UNIVERSITY
STOCKHOLM WATER TECHNOLOGY AB
SVENSK VENTILATION UPONOR UPPSALA UNIVERSITY**



MISTRA
TERRACLEAN

RI.
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Sensor needs in Mistra TerraClean



Mistra TerraClean - A Smart Materials Programme

What is a smart material?

A material responding to external stimuli

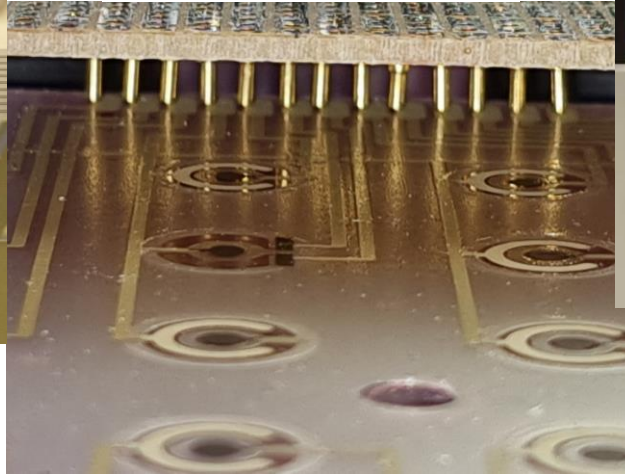
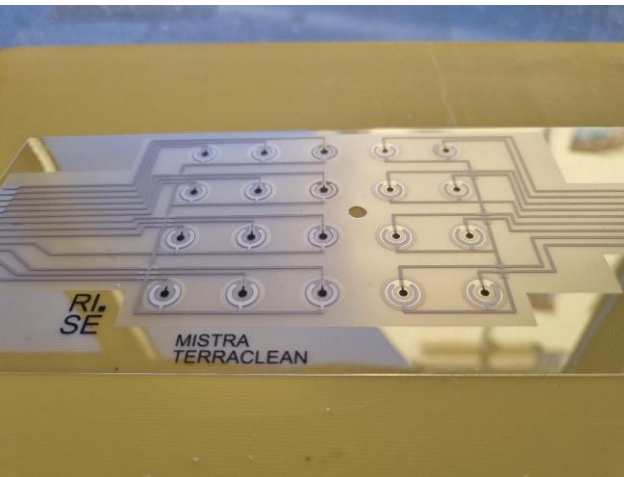
When the stimulus is electric, potential, current or field,

*the task of developing a smart material for water cleaning
is identical to the task of developing an electrode*

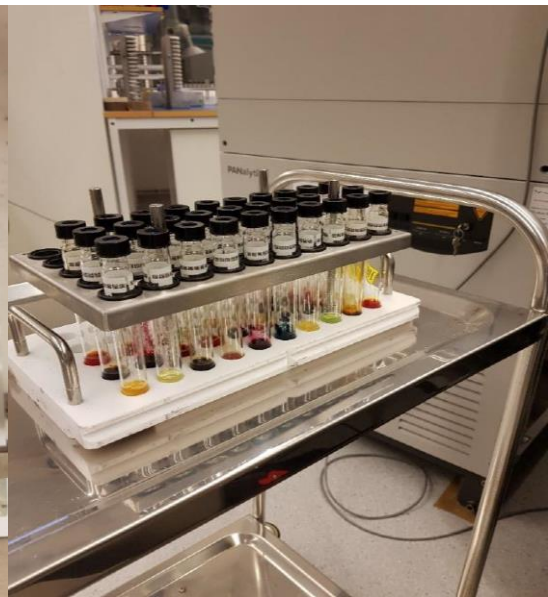
Our methodology approach:

Low cost printed arrays of electrochemical cells

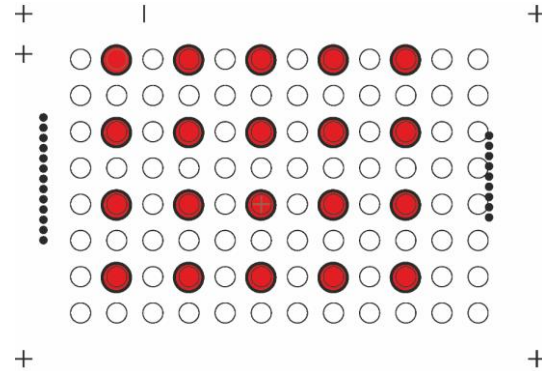
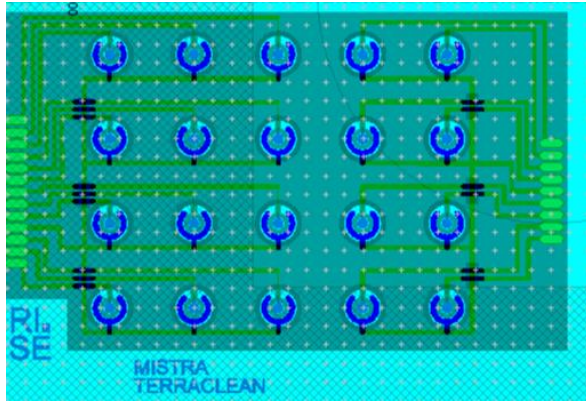
Designed to fit into a robot for dispensing on and handling well plates



The PROTEUS facility

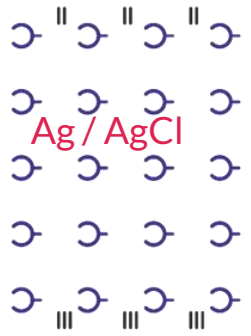


Design arrays of electrochemical cells positioned in register with wells in 96 well plate positions





Ag traces



Ag / AgCl



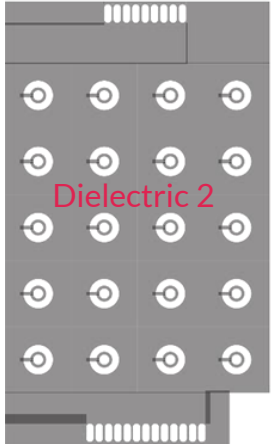
WE / carbon

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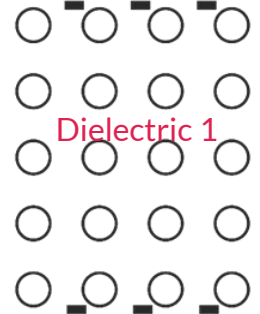
R|SE



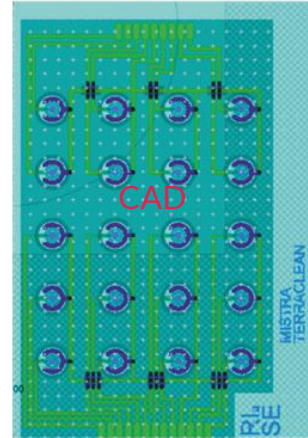
Screen printing



Dielectric 2



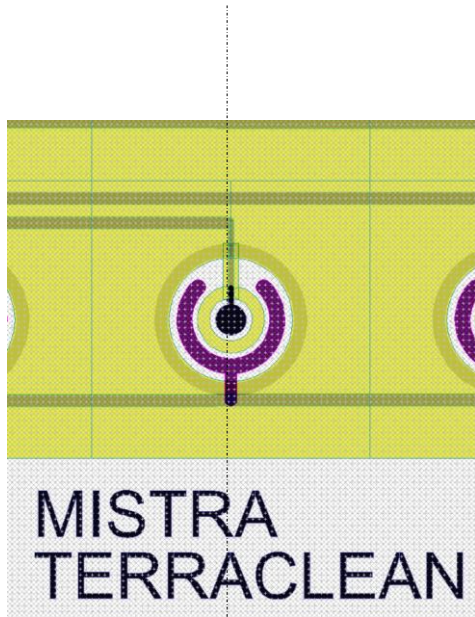
Dielectric 1



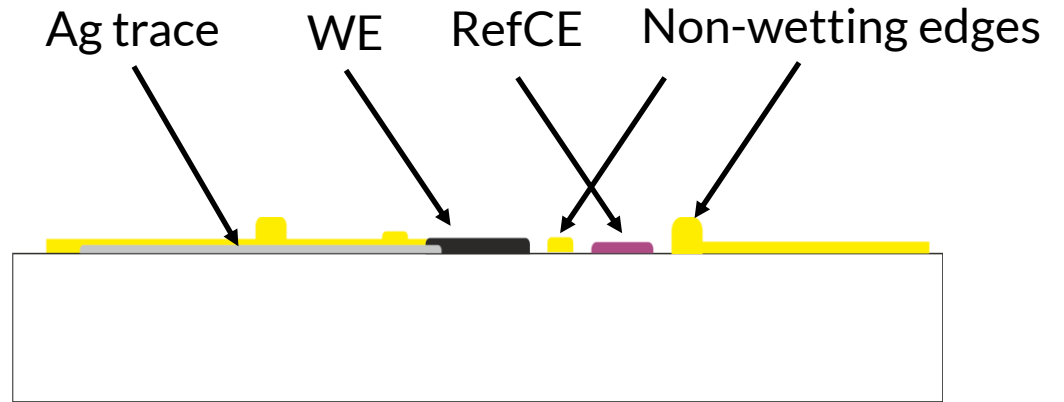
CAD

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top view



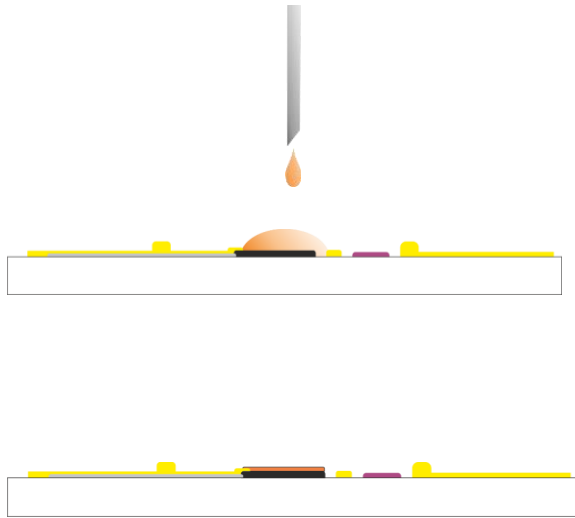
cross-section



Deposition modes of working electrodes

Mixing - Dispensing - casting

WE composition variations over the array



Screen printing



Use-modes of robotized mixing dispensing



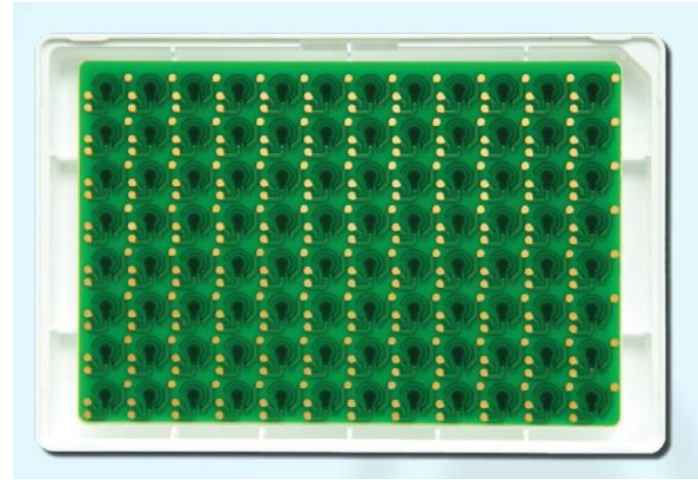
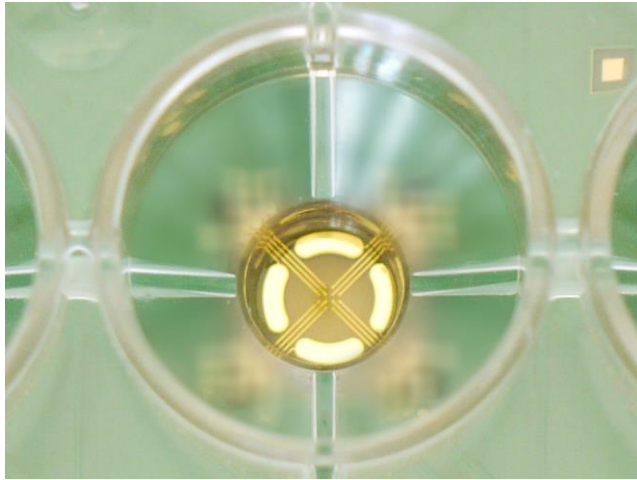
Arrays of WE compositions

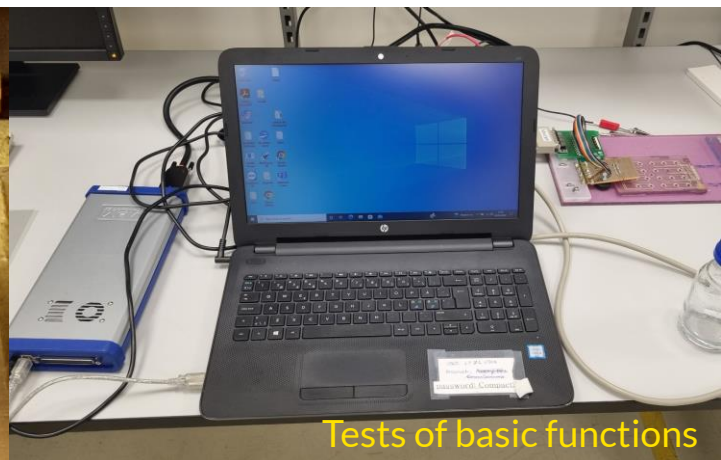
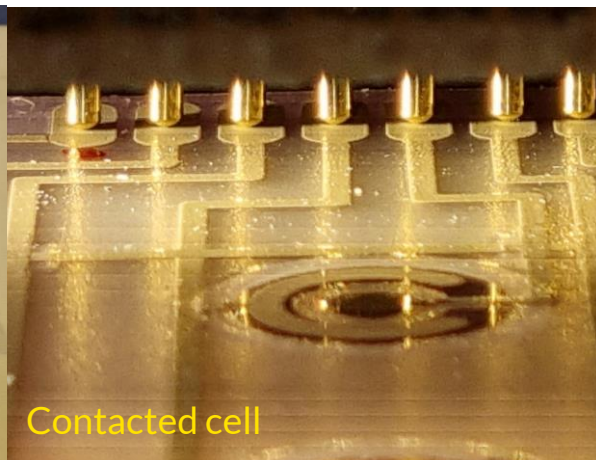
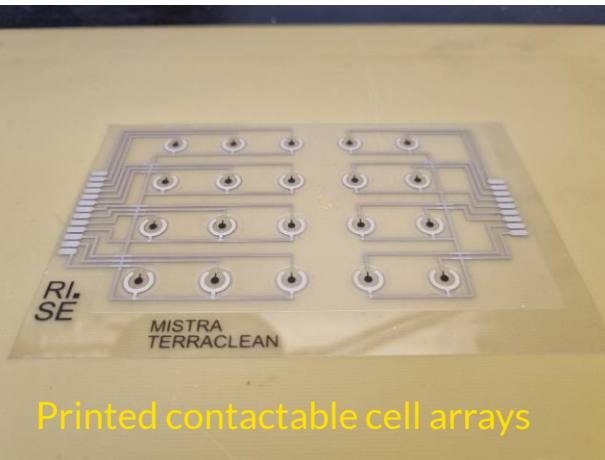
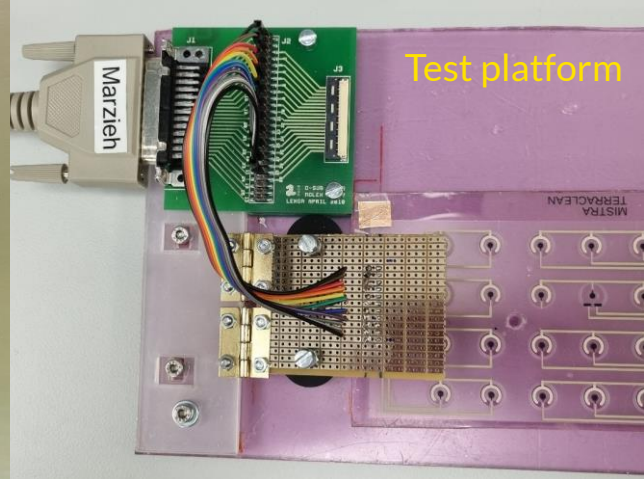
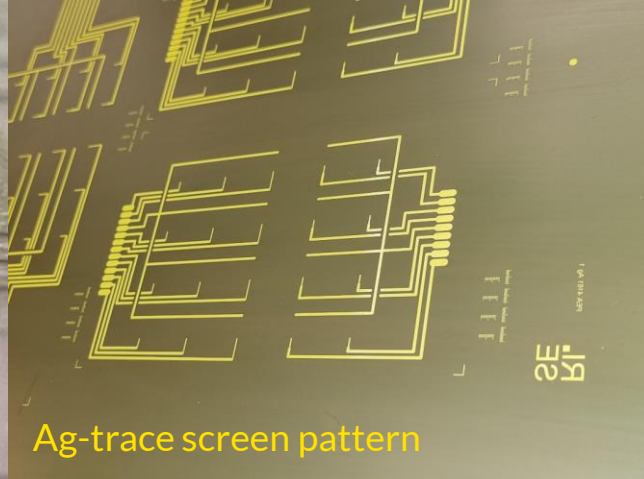
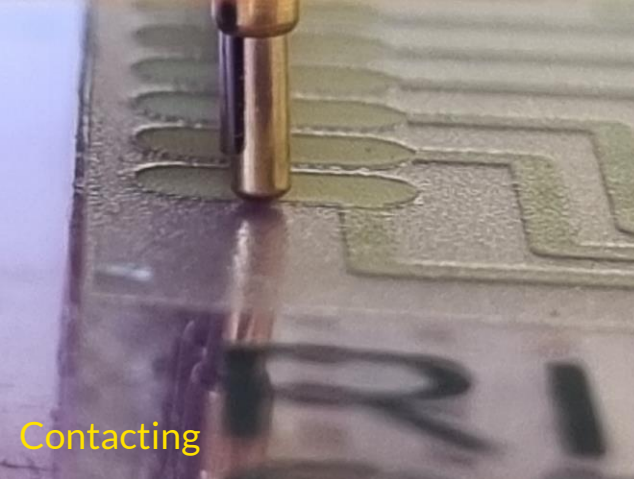


Arrays of different analyte compositions

- concentrations - detection limits
- Interferants - selectivity
- real water matrices – high throughput

Existing products on the market





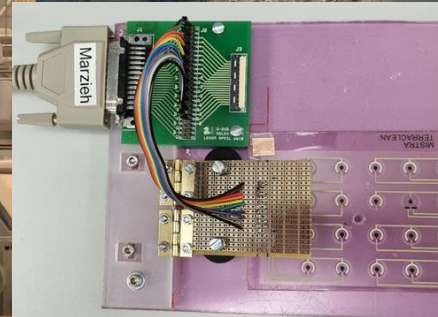
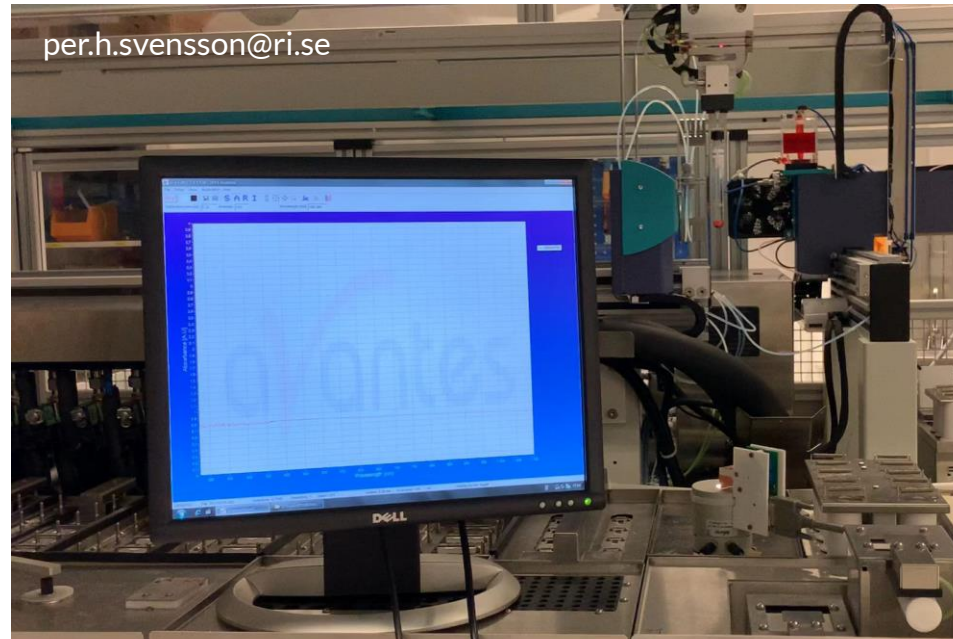
Next step after validation of basic functions: Implement EC station in PROTEUS

PROTEUS do:

- Mix and dispense analytes on EC cell well array.
- Place into EC-station

EC STATION do:

- Connect EC well plate to multichannel potentiostat



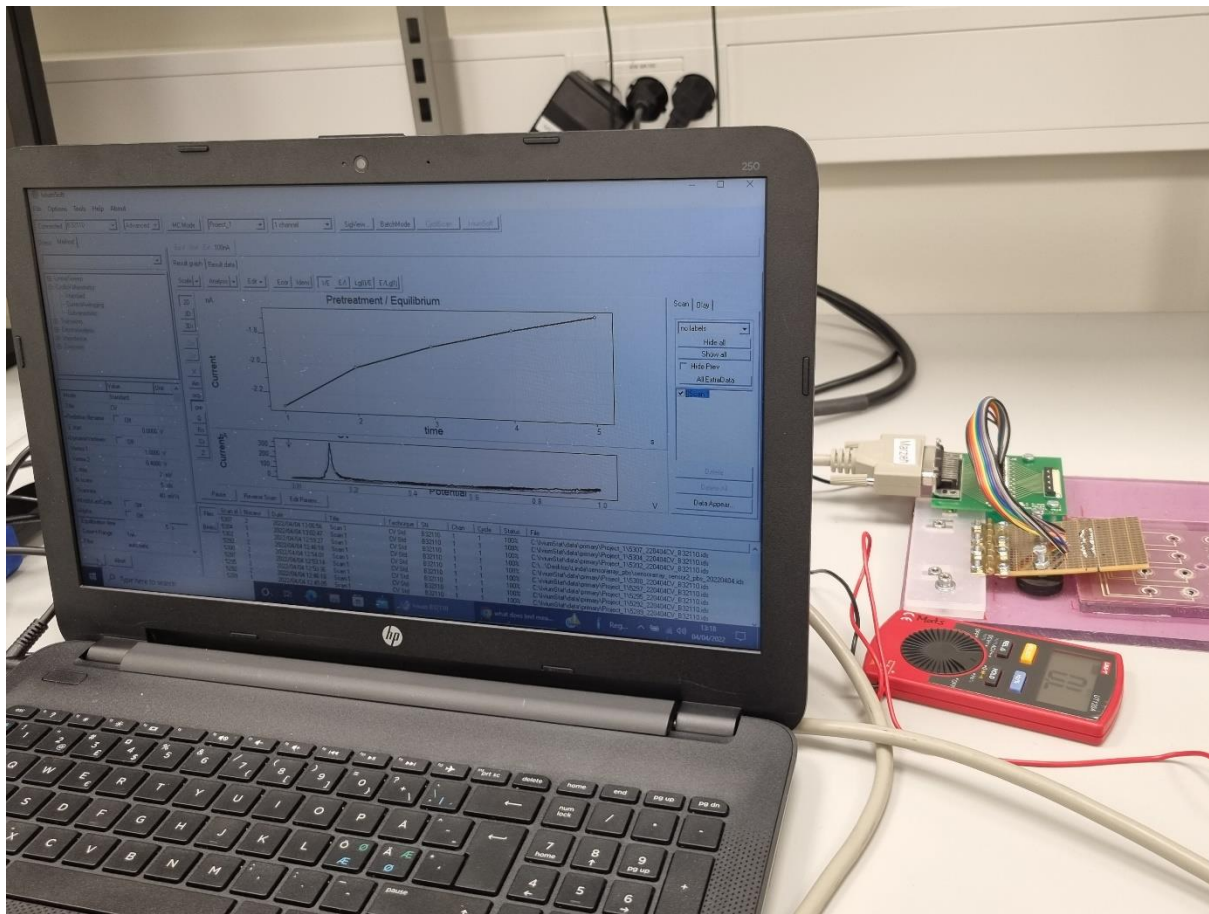
Questions?

Your needs for low cost tools for robotized testing?

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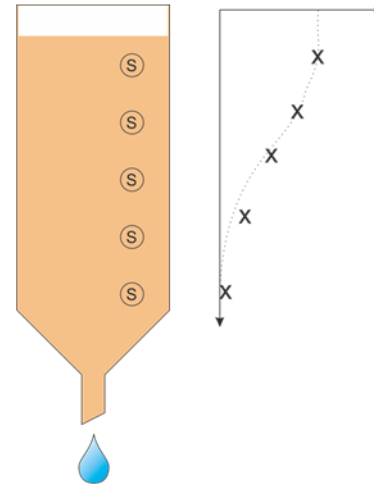
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Today
indirect
monitoring
of filter SoH



An MTC concept:
direct monitoring of
filter SoH



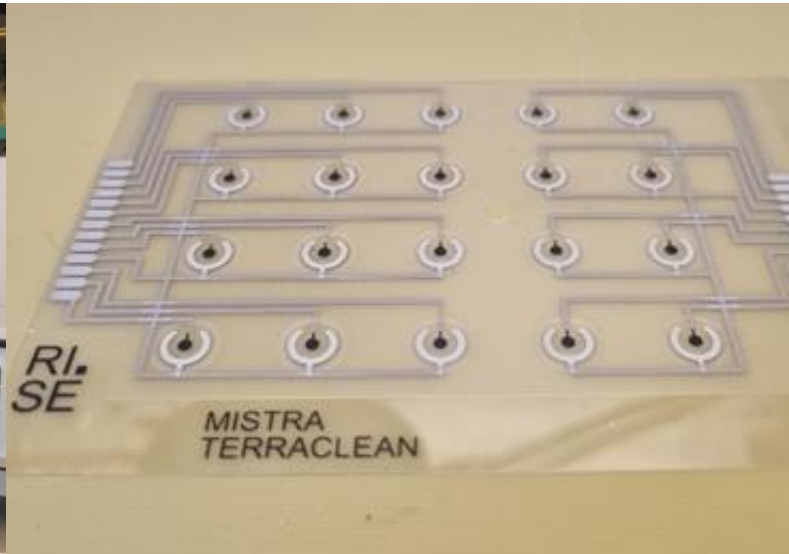
Concept

Integrate arrays of contactable EC cells plates in a robot for dispensing on and handling well plates

PROTEUS robot



arrays of contactable EC cells



contact station

