



Sensor Biofouling: Impact and Solutions

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Water Sensors + First Nations Water

2/35

Ravi Selvaganapathy et al. (14 Co-PIs)

GWF: Sensors and Sensing Systems for Water Quality Monitoring



Dawn Martin-Hill et al. (4 Co-PIs + 9 Co-Is)

GWF: Co-creation of Indigenous Water Quality Tools



Sensor Fouling for Sensors Tracking First Nations Water Quality

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Enabling Long-Term Water Sensing

3/35

Sensors in the Environment must:

- Measure relevant compounds
- Be reliable
- Be accurate
- Have signal stability

Must resist various environmental factors:

- Biofouling
- Mineral scaling
- Temperature fluctuations



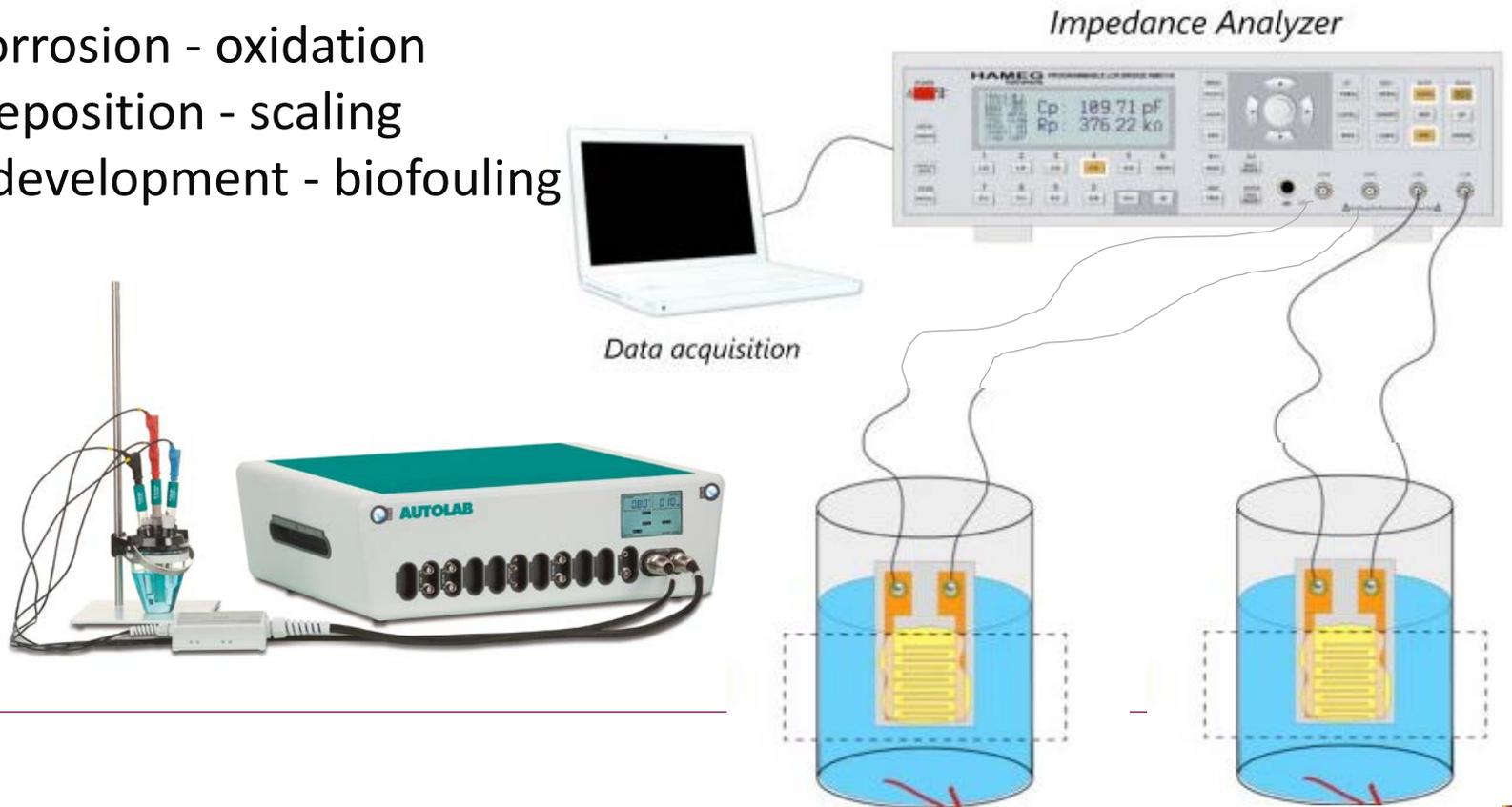
Fouling Impacts Sensors

Characterization of Sensors(EIS, CV, signal strength, selectivity)

Surface corrosion - oxidation

Mineral deposition - scaling

Bacterial development - biofouling



Sensors for Six Nations Water Quality

5/35

Where to sense

What to sense



How will those environments impact sensors

Where to Sense – Six Nations Water

6/35

We are working in collaboration with the community members of the Six Nations of the Grand River

- They are letting us know what water sources we should test and where
- Community lead

This requires strong community connections

- Community navigators
- Community interest
- Community trust

So far 20 households have volunteered representing ~75 community members



Protocols for Water Sample Collection

7/35

Source of Water on Six Nations:

- Six Nations Water Treatment plant
- Cisterns
- Wells
 - Bored
 - Drilled
- Bottled water



Learning how community members use their water
drinking, cooking, hygiene

Sampling from taps

Sampling from wells and cisterns

What to Sense – Water Quality Assessments

8/35

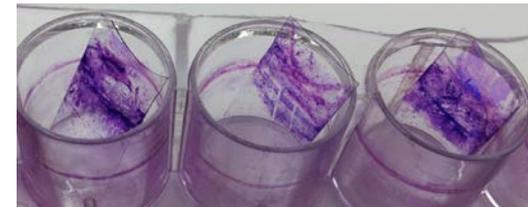
- Physico-chemical parameters leading to scaling

- pH
- TOC
- turbidity
- Mineral content
- Heavy metal content



- Microbial parameters leading to biofilms

- 16S rRNA analysis
- Identify biofilm producing bacteria in local waters
- Grow single species biofilm
- Grow biofilms from collected samples
- Compare with biofilms grown from single species



Six Nations Water Quality Considerations

9/35

Type and age of well

Gypsum Mining

Farming

Chemical/tobacco processing

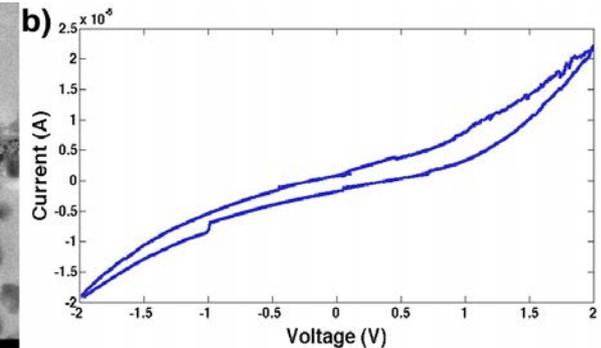
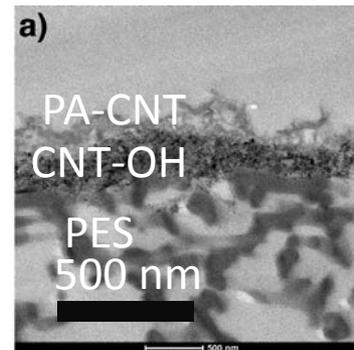
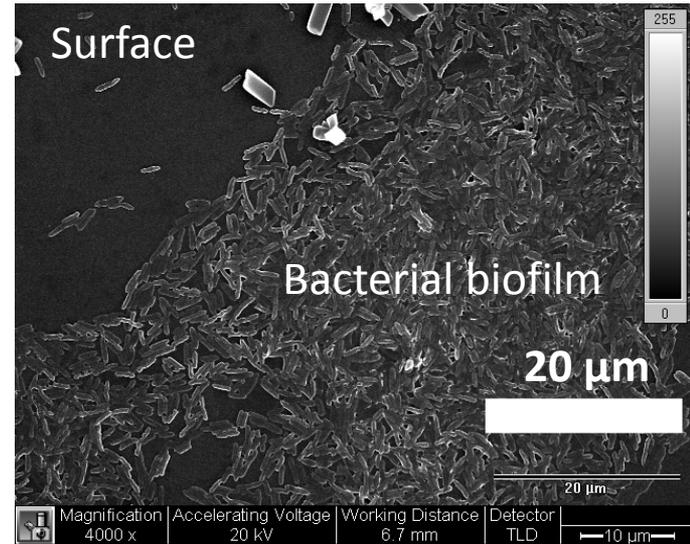
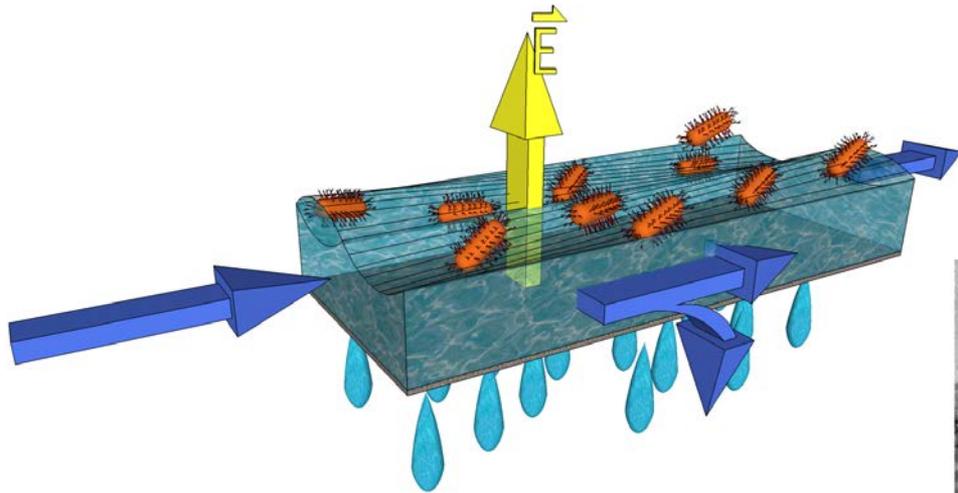
Natural Gas exploration

Strategies to Prevent Sensor Fouling

10/35

Various Strategies to prevent fouling:

- Electrical Induced Inhibition
- Bacteriophage Inhibition
- Bubble generation Inhibition



Acknowledgements

11/35

The Six Nations of the Grand River
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