Performance Evaluation of Fiber Optical Oxygen Sensor

Roha Afzal, Pritha Nanda, Newton King, Tunan Peng
Department of Chemical and Biomedical Engineering
University of South Florida

❑ABSTRACT:

Fiber optic sensing is a relatively new dimension in the field of sensing and the performance analysis of FOS in a biological environment still requires a lot of intensive research for most part. Our project was mainly targeted toward the performance evaluation of a FO Oxygen sensor developed by Fluorometrics Instruments in a biological environment. The sensor was tested in a live bacterial culture for its accurate, precise and repeated measurements of dissolved Oxygen while manipulating the measurand with certain factors.

❑ INTRODUCTION:

Fiber Optic Sensor (FOS) uses optical fiber either as the sensing element or as a means of relaying signals from a remote sensor to the electronics that process the signals.

▪ADVANTAGES:

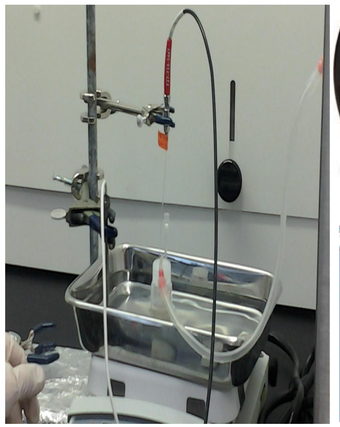
- Size and flexibility
- Sterilizable
- Low production cost
- Easy calibration
- Long lifespan and disposable
- Resistance to electromagnetic interference , moisture, corrosion etc

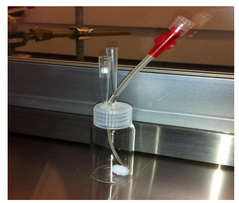
▪OBJECTIVES:

1.Performance evaluation of FOS in a biological medium
2.Test and investigate for problems like Bio fouling, Bio compatibility, Toxicity etc.

❑ EXPERIMENTAL SETUP:

- Test environment: E-Coli Bacteria.
- Bio Reactor.
- Manipulating Factors of Dissolve Oxygen (DO): Air Sparging/Magnetic Stirring/Anti-foaming agent/ Glucose solution under -/+ sparging & -/+stirring conditions
- Water bath to maintain test environment temperature
- Oxygen Sensor has USB interface with computer.
- Dissolve Oxygen (DO) measurements recorded in the Software - NeoFox viewer.

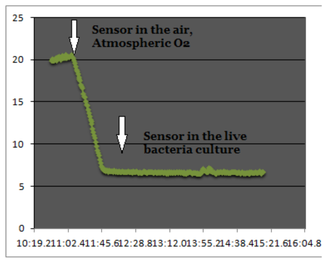




▪ BACTERIA CULTURE:

- 3 ml of LB broth (Luria Broth) to a 14 ml culture tube .
- Inoculating -frozen glycerol stock
- Bacteria growth- 16 h at 37C/225 rpm.
- Starter culture - transferred to a 250 ml shake flask containing 25 ml of LB broth.
- Further incubated for ~2 h at 37C/225 rpm

❑RESULTS:



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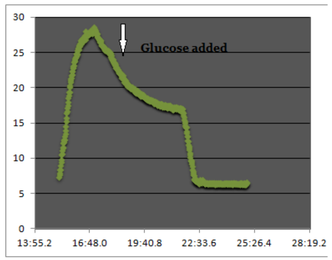

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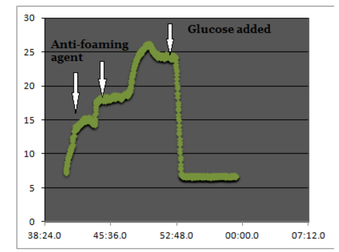

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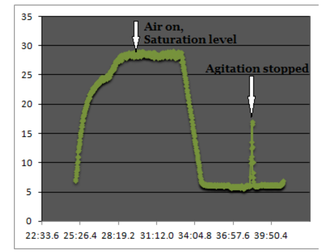

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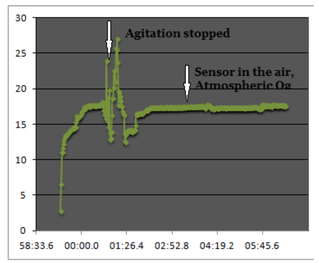

Event 5

❑ CONCLUSION:

Sensor is:

- Capable of accurately sensing in a bioreactor
- Able to yield precise results

Although the sensor is still in its early stages, it has already shown signs of being a very affective and promising sensor. The next steps to making this sensor marketable are running experiments on the potential effects of bio fouling on the detected oxygen levels. Also conducting experiments in an environment which is more controlled would prevent errors caused by changes in temperature. These experiments would yield more quantitative results, which would greatly progress the oxygen sensor to its goal of being accurate.

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