

**SENSITIVE SENSOR FOR REAL TIME MONITORING OF HYDROGEN
SULFIDE (H₂S) AS A WATER POLLUTANT**

JIM KIMATHI RIUNGU

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DECLARATION AND RECOMMENDATION


Declaration


This thesis is my original work and has not been presented elsewhere for examination, award of diploma, publication or conferment of degree in any institution.

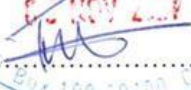
Signature:  Date: 04/11/2024
Jim Kimathi Riungu
SM19/38563/18


Recommendation

This thesis has been submitted for examination with our approval as the candidate's supervisors

Signature:  Date: 04/11/2024
Prof/ Kamweru Paul Kuria
Chuka University

Signature:  Date: 04/11/2024
Dr. Muthui Zipporah (Ph.D.)
Chuka University

Signature:  Date: 04/11/2024
Dr. Martin Grell (Ph.D.)
United Kingdom



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DEDICATION

I dedicate this thesis to my parents, my wife Winfred Ntinyari, my son Dawin Jim and also to my supervisors who never got tired in advising me throughout the journey.

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ABSTRACT

Water is a finite and a vital resource. Monitoring its pollution is therefore vital in the prevention of the negative impacts that it can have on the environment and human health. Through water pollution, hydrogen sulfide (H_2S) is fed into water. Recycling of waste water necessitates efficient and real time sensing of the presence of hydrogen sulfide. Even though significant effort of sensing hydrogen sulfide in water has been made, the sensors and mechanisms used are limited in level of detection, not portable, do not detect in real time, lack well-trained personnel to handle them and are highly expensive. In addition, they require complex instrumentation and have possibilities of introducing additional contamination in water. Therefore, this study designed a real time, highly sensitive, effective, cheap and portable sensor based on dye absorption, squarylium dyes (SQ1) and modern lock-in amplifier, to sense the presence and concentration of hydrogen sulfide (H_2S) in water. A Light Emitting Diode CHANZON (LED) with emission wavelength of 650-660 nm was coated with SQ1 dye to act as a sensing region. Its warm up in air and in the analyte was found to be 25 minutes and 20 minutes respectively, which was accounted for in data collection. 1.647 M H_2S was diluted accordingly, to yield two stock solutions, 1 and 2 with concentration 100 μM and 5 μM respectively. The voltage response V_{out} from the lock-in amplifier was read against time at different concentration of H_2S and a graph of V_{out} (mV) against time (minutes) was plotted and used to provide changes in V_{out} when different aliquots were added. The limit of detection (LoD) was found to be 25 nM. This LoD is 60 times lower than the potability of H_2S_{aq} which is 1.5 μM . Because of the high sensitivity and low LoD (25 nM) of the developed sensor, this study concludes that the sensor can be used for real-time monitoring of presence and concentration of H_2S in water. This will in turn help in water recycling and also ensure consumption of clean water free of H_2S , which is hazardous to human health.