A CONTINUOUS AUTOMATED SYSTEM AND METHOD FOR SENSING OF NITRITE IN WATER
IITM Technology Available for Licensing

PROBLEM STATEMENT

➢ **Water quality** is crucial for all living organisms, but anthropogenic sources like livestock waste, organic waste, and fertilizers cause significant contamination.

➢ **Early detection of nitrite** and nitrate in water is essential to prevent further damage and prevent environmental issues.

➢ **Conventional methods** for detecting contaminants include spectrophotometric, chemiluminescence, electrochemical, chromatography, capillary electrophoresis, and spectrofluorimetric.

➢ However, these methods require expert assistance and are sensitive but expensive.

➢ **Automated real-time monitoring systems are needed** to address challenges and improve water quality, including low-cost sensors and environmentally friendly systems.

TECHNOLOGY CATEGORY MARKET

Technology: Water quality monitoring
Category: Environmental Engineering Chemistry & Chemical Analysis
Industry: Water & Wastewater Management
Application: Both domestic and industrial applications for real-time online water quality monitoring of Nitrite.
Market: The global market size of water Quality Monitoring Market is likely to grow with a **CAGR of 5.51%** during the forecast period 2023-2030, and reach a revenue of **$8275.72 million by 2030, from $5420.38 million in 2022**.

INTELLECTUAL PROPERTY

IITM IDF Ref. 2588
Patent No: IN 533197;

TRL (Technology Readiness Level)

TRL-4, Experimentally validated in Lab;

Research Lab

Prof. Boby George
Dept. of Electrical Engineering, IIT Madras.
Prof. Ligy Philip
Dept. of Civil Engineering, IIT Madras.
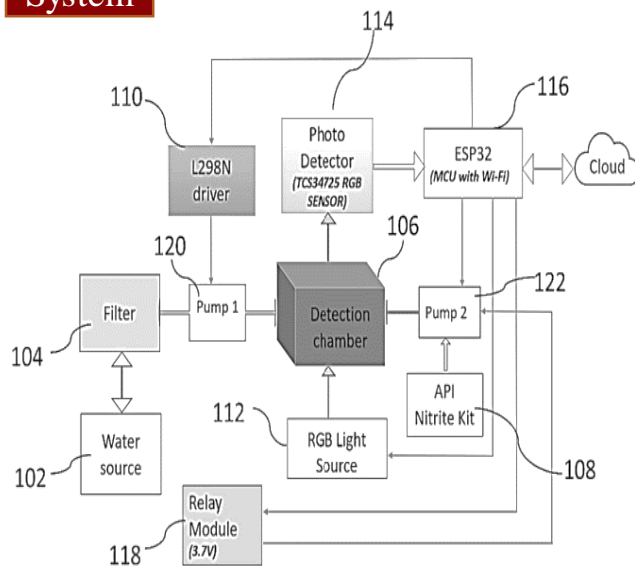
TECHNOLOGY

System

Figure 1 illustrates **a real-time monitoring automated system** for sensing of nitrite in water,

❖ **A real-time continuous monitoring automated system for sensing of nitrite** in water by colorimetric method, the system comprising:

❖ **Detection Chamber** configured to do a preliminary colour analysis of a sample and **cuvette** to hold the sample and wherein the sample is pumped to the chamber.

❖ **Driver Circuit** configured to enable pumping of the sample and a reagent to the detection chamber.

❖ **An automated mixing mechanism** with a servo motor to mix sample with reagent and **a light source** for incubation.

CONTACT US
Dr. Dara Ajay, Head TTO
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719

- ❖ **Photo detector** for record the absorbance of light by the sample and the sample reagent mix to obtain a secondary color analysis.
- ❖ **A Microcontroller and Relay module** for automated operation, and
- ❖ **A Rinse and Drain Mechanism** for cleaning the cuvette for fresh sample sensing.
- ❖ The system uses white light with good sensitivity in **green and blue ranges**, focusing on a **20mm cuvette with a 7ml** volume capacity.
- ❖ A Plano-convex lens focuses light onto a color sensor in a photo detector, recording **absorbance at 543 nm**. Nitrite concentration is detected using a reagent.
- ❖ The system minimizes interference from external disturbances and uses **ratio metric analysis to remove stain and color effects**.
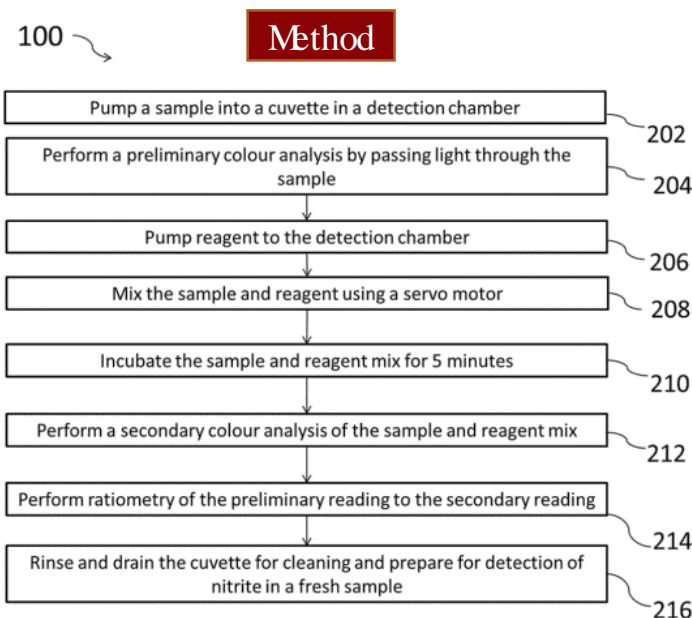

Figure 2 illustrates **a method for detection of nitrite in water**, according to an embodiment of the present subject matter

Key Features / Value Proposition

- ✓ The system utilizes **online sensing techniques** to monitor water quality in aqueous systems in **real-time**, utilizing a fully automated and portable system.
- ✓ The online colorimetric sensing technique is a method that is **independent of the stain's effects** on the detection chamber and **the color** of the tested sample.
- ✓ The study aims to provide **fast, accurate**, and continuous measurements of nitrite in water.
- ✓ The detection process is automated and **results are verified using cuvette staining** and external-colored compounds in the water system.

- ✓ The online nitrite detection system is **reliable** and automated, detecting **nitrite** in the **0-10 mg/L** range.
- ✓ It eliminates stain or color development, and **no humidity limitations** are present.
- ✓ **Low-cost, portable**, and automated devices, with a **readily available test kit.**

CONTACT US

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Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imal.iitm.ac.in
Phone: +91-44-2257 9756/ 9719