

ABSTRACT SYMPOSIUM NAME: Sensors for Water Quality Assessment in Resource Limited Environments

ABSTRACT SYMPOSIUM PROGRAM AREA NAME: ENVR

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PRESENTATION TYPE: Oral Preferred : Do not consider for Sci-Mix

TITLE: Modification of the SPADNS method to develop a sensor as a dye sensitized strip in assessing fluoride levels in drinking water

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ABSTRACT BODY:

Abstract: Free fluoride ions and the metal complexes of fluoride ions are one of the main groundwater pollutants affecting over 200 million people around the globe including Africa, South Asia and Middle East. Assessment of fluoride ions based on techniques ISE, IC and colorimetry require sophisticated instruments, which must be operated inside laboratories. The objective of this project is to develop a fluoride sensitive strip that is portable and cost effective.

The SPADNS method is a well-accepted method for fluoride analysis. The above method is modified as a fluoride sensitive strip to detect fluoride concentrations above safe drinking standard value 1.5 mg/L of fluoride. Whatman # 41 ashless filter paper is modified with titanium butoxide via a sol-gel process. The coating is a TiO₂ thin film deposited on the surfaces of substrates of commercial cellulose filter paper and cellulose fabric. The red color SPADNS-Zr dye which is the probe was grafted on to the titania layer of the modified strip. The resultant dye sensitized strip which is the sensor for the detection is dark blue. The modified strip shows rapid and obvious color change from dark blue to pale pink in the presence of fluoride ions and the original color (red) of the dye appear in the solution.

The strips were tested with solutions of fluoride concentrations ranging from 1-100 ppm for both substrates. There are no interferences to the method by H⁺ ions (pH 3-7), sulphates (20 ppm), carbonate bicarbonate buffer and other halogen ions such as chlorides (20 ppm) and bromides (20 ppm). A hypothetical mechanism for the sensing reaction is proposed based on the experimental observations and results obtained from the characterization techniques such as FT-IR, Solid UV/Vis, XRD, AAS, SEM and EDX analysis.

(No Image Selected)