

# **Electrochemistry Experiments to Develop Novel Sensors for Real-World Applications**

**Suzanne Lunsford, Ph.D.**

**Wright State University**

**Professor of Chemistry**

**3640 Colonel Glenn Hwy.**

**Dayton, OH 45435**

## **ABSTRACT**

These novel STEM (Science Technology Engineering and Mathematics) Electrochemistry experiments have been designed to increase the integrated science content, pedagogical, and technological knowledge for real-world applications. This study has focused on (1) the fundamental understanding on the relationship of metal oxide films and polymers to electrochemical sensors, and (2) the development of new materials which have great application of electrode materials.

Following the inquiry based learning strategy the research students learn to develop and study the electrode surfaces to meet the needs of stability and low detection limits.

Recently, new advances in environmental health are revealing the anthropogenic or naturally occurring harmful organic chemicals in sources of water supply expose a great health threat to human and aquatic life. Due to their well-known carcinogenic and lethal properties, the presence of human produced toxic chemicals such as phenol and its derivatives poses a critical threat

to human health and aquatic life in such water resources. In order to achieve effective assessment and monitoring of these toxic chemicals there is a need to develop in-situ (electrochemical sensors) methods to detect rapidly. Electrochemical sensors have attracted more attention to analytical chemist and electrochemistry engineers due to its simplicity, rapidness and high sensitivity. However, there will be real challenges of achieving successful analysis of chemicals (phenol) in the presence of common interferences in water resources, which will be discussed regarding the students challenging learning experiences in developing an electrochemical sensor. The electrochemical sensor developed ( $\text{TiO}_2/\text{ZrO}_2$ ) will be illustrated and the successes and limitations will be shared during the presentation.

**Keywords:** Hands-on /Inquiry-based learning, Professional development, Electrochemistry, and Informing via Research .