Sensitive Electrochemical Nitrite Sensing Based on Carbon Black gold Nanoparticles modified Screen Printed Electrode

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Nitrite salts are widely used in industrial manufacturing and overfertilization can lead to the contamination of surface water and groundwater. For example, nitrites can cause the transformation of normal hemoglobin to methemoglobin, leading to loss of hemoglobin's ability to transport oxygen and can also lead to accelerated algae growth and eutrophication of large bodies of water. There is an unmet need for portable, reliable and economical sensor for nitrites due to its ubiquitous nature and toxicity. Herein, we demonstrate that a screen-printed electrode (SPE) can be utilized for the detection of nitrite in aqueous solutions. Coating the sensor with carbon black gold (CB/AuNP) nanoparticles creates an increase in sensitivity and signal amplification. The sensing of nitrite can be done at the micro molar level via cyclic voltammetry, differential pulse voltammetry and square wave voltammetry. The sensor demonstrated a wide linear range of concentration detection from 0.1 to 70 mM at pH 3 with a detection limit of 0.1 mM nitrite in water sample. The practicality of this sensor approach was shown by measuring the concentration of nitrite ions in tap and spring water samples. The disposable CB/AuNP SPE offers great potential for a low cost, portable and economic approach for nitrite detection in seawater samples.

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