

**Title :** Development and Evaluation of a Low-Cost Spectrophotometer for Sensitive and Accurate Nitrate Analysis in PM2.5 extraction solution.

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**Major :** Chemistry

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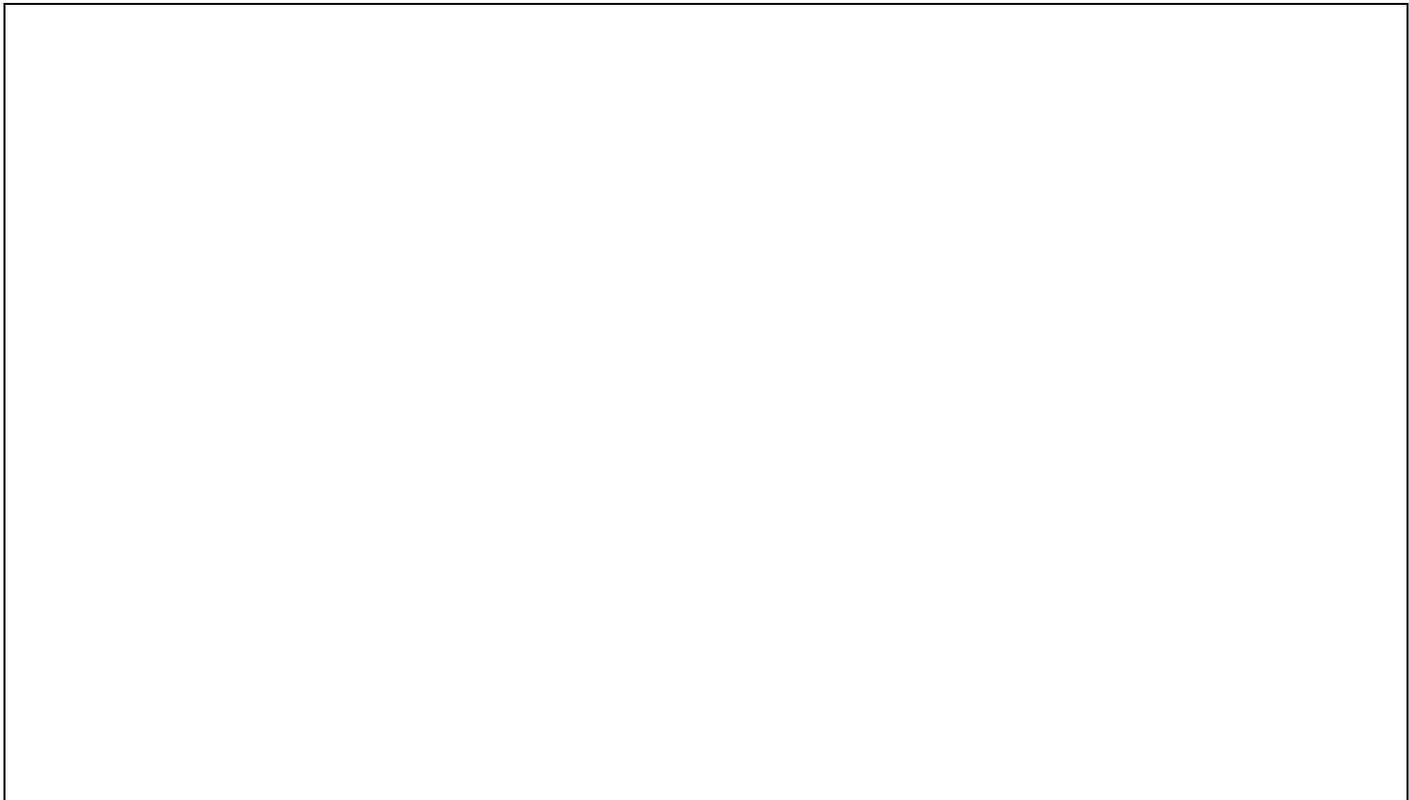
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## ABSTRACT

The impact of particulate matter of less than 2.5 micron of diameter (PM2.5) in the air is affected by its various components. Nitrate is a significant component in PM2.5 that contributor to health and environmental issues. Quantification of nitrate in PM2.5 is typically performed by reducing nitrate to nitrite and measuring it in the form of nitrite. Spectrophotometers are expensive and difficult to access. Therefore, this study aims to develop a low-cost spectrophotometer for analyzing nitrate in the form of nitrite. The developed spectrophotometer operates on the principle of light absorption at specific wavelengths using a colorimetric reaction with Saltzman reagent, which correlates with nitrite concentration. Cost-effective components, such as LED light sources and photodiode detectors, were selected to reduce production costs. The device is designed to be user-friendly and portable, making it suitable for small laboratories, educational purposes, and field measurements. Performance evaluation of the developed spectrophotometer showed an average absorbance of 0.093 for nitrite standards, compared to an average absorbance of 0.097 from commercial spectrophotometers. The device demonstrated a Limit of Detection (LOD) of 0.015, a Limit of Quantification (LOQ) of 0.044, a Standard Deviation (SD) of 0.002, and a Relative Standard Deviation (%RSD) of 1.66%. Results from F-test and T-test comparisons with standard spectrophotometers indicated no statistically significant differences in variance and mean values. These findings confirm the reliability of the low-cost device for quantitative nitrate analysis and suggest its potential as an affordable solution for environmental monitoring.

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Associate Professor	รองศาสตราจารย์
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Assistant Professor	ผู้ช่วยศาสตราจารย์
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Industrial Chemistry	เคมีอุตสาหกรรม
Materials Science	วัสดุศาสตร์
Physics	ฟิสิกส์
Computer Science	วิทยาการคอมพิวเตอร์
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