Advancements in Automated Nitrogen Detection via Surface Enhanced Raman Spectroscopy and Wavelet Transform Background Subtraction

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Nitrates and phosphates are vital macronutrients for plants and animals, and their levels in seawater provide important information when assessing the coastal ecosystem. At the moment, nitrate and phosphate levels are being measured, but their analyses are outdated. A self-sustaining sensor with a high sensitivity and selectivity for nitrate and phosphate would be beneficial. Surface Enhanced Raman Spectroscopy (SERS) is a well-known spectroscopic technique that utilizes surface roughened substrates to provide Raman enhancement to help detect analytes at a single molecule level. Due to its high sensitivity, SERS is a promising candidate for a nitrate or phosphate sensor when combined with a selective filter.

Our work has shown the advancements SERS coupled with selective chemical reactions to nitrate can make in the field of nitrate detection, along with a background subtraction method to be used for real time analysis.