

Colorimetric, Paper-Based Detection of Phosphate in Marine Environments

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In marine ecosystems, high concentrations of certain nutrients such as phosphate lead to undesired algal growth and low levels of dissolved oxygen. Such conditions are deadly for fish, shellfish and other marine organisms. The rapid and robust detection of these nutrients using a colorimetric, paper-based system that can be applied on-site, is of high interest to individuals monitoring marine environments. The spectrophotometric molybdenum blue method is a well-established method for detecting phosphate that involves the formation of molybdophosphoric acid from ortho phosphate and an excess of molybdate in acidic solution followed by reduction to give a molybdenum blue complex. Phosphate detection systems that use the molybdenum blue method have already been developed, but most of them suffer from high detection limits, reagent instability and require the user to handle highly toxic reagents. For these reasons, the development of a new and improved detection system is necessary.

Reported herein, is the development of a paper-based, colorimetric detection system for phosphate with improved stabilization of the molybdenum blue reagent. The colorimetric response of the system was analyzed and quantified using RGB analyses (ImageJ), allowing for more precise analysis than naked-eye detection permits.