

MASTER'S THESIS

Real-time ocean optical fiber sensing of phytoplankton for studies in size distribution, concentration and biomass

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Real-time Ocean Optical Fiber Sensing
of
Phytoplankton for Studies in
Size Distribution, Concentration and Biomass

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Abstract

Flow cytometry is a powerful technique for particle analysis in medical science. It has found useful applications in biophysical applications such as phytoplankton analysis. Phytoplankton is a good indicator of seawater quality. Developing a field type flow cytometry to obtain information of phytoplankton is a good and efficient way to monitor the seawater quality. The critical optical alignment of the cytometer limits its application in field measurement. A modified flow cytometer was proposed to overcome the alignment requirement and the cytometer developed requires no sample preparations to enable monitoring the seawater quality in field at all times. Our system combines the techniques of flow cytometer, laser Doppler velocimetry, laser induced fluorescence and optical fibre sensing to overcome problems in field measurements. The setup was used to measure size distributions and concentration for cultured phytoplankton, seawater samples and actual field measurement. Corresponding size distribution and concentration of different water samples from different coastal areas of Hong Kong show a promising development of our new technique. The success of field measurement proved the system has potential for further development into a practical portable instrument to study phytoplankton ecology and to monitor seawater quality.

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