A Rapid One-Step Field-Based Detection Method for Nanoplastics in Wastewater Samples

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The widespread use of plastics has raised concerns about their persistence in aquatic and terrestrial environments. Tiny plastic particles, microplastics, and nanoplastics which are generated by degradation cause real environmental problems. Rapid identification of potential hotspots of nanoplastics contamination has been challenging due to lack of field-based detection methods. The purpose of this study was to develop a single-step field-based method to detect nanoplastics in wastewater samples. Using a custom-designed single channel fluorometer, several parameters such as linearity of signal, sample incubation times and effects of sample shaking were optimized using Nile Red dye. A one-step Nile Red based method was successfully developed to detect nanoplastics in filtered wastewater samples within 10 min. The limit of detection of nanoplastics detection was 35 micrograms/mL. Clarification of treated wastewater samples during the treatment cycle resulted in significant reduction of nanoplastics levels. Nanoplastics load was always higher in influent wastewater samples compared to effluent water when samples were monitored from monthly collections over a 6-month period. This method can be broadly used to monitor nanoplastics levels in different water streams which drain into urban watersheds.