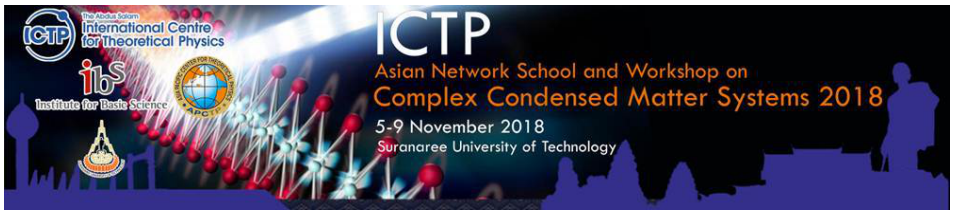

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Detection and trace analysis of Rhodamine B using silver nanowires as surface-enhanced Raman spectroscopy substrates

The access to clean and potable water is an important challenge especially in Southeast Asian countries that are surrounded by bodies of water. Water contaminants such as dye effluents pose health hazards even in trace amounts and need to be accurately detected and quantified. Among various analytical techniques, Raman spectroscopy is recently becoming popular as a tool for the detection of pesticides, heavy metals, and organic dyes. In this work, we investigate the potential of silver nanowires (Ag NWs) as surface-enhanced Raman spectroscopy (SERS) substrates for the detection and quantification of organic dyes. The Ag NWs were synthesized through an electroless deposition method and stored in an alcohol-based colloidal suspension. The Ag NWs were deposited in a paper substrate that keeps the NWs from spreading. Rhodamine B (RhB) powders were diluted in varying concentrations and then dropped on the Ag NW SERS substrates. Micro-Raman spectroscopy was performed using a custom-built optical system under 532 nm optical excitation. The results showed that the Ag NWs SERS substrates can detect RhB up to a concentration of 1 μM. In addition, the SERS intensity follows a power law relation with the RhB concentration as shown by the linear fit in the log-log plot. The study demonstrates that SERS is a viable technique for the detection and quantification of trace contaminants in water with minimal preparation and using small sample amounts.

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