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Turbidity Correction for Raman Spectroscopic Measurements in Aqueous Systems

A new technique employs Raman spectroscopy to accurately measure analytes in highly turbid liquid systems, enabling quantitative analysis for various water and industrial applications.

Turbidity is the measure of the loss of optical transparency of a medium resulting from the presence of suspended solids or other interfering matter. This is especially common in aqueous media in natural environments. While the suspended solids can be removed, for example via filtration, that removal can have significant influence on the accuracy of spectroscopic readings and tests. Improvements in diode laser, fiber optic, and data acquisition technologies allow for increased use of Raman spectroscopic techniques for both in lab and in situ water analysis, but there remains a need for methods to correct for turbidity.

Researchers at Purdue University have developed a new technique to correct turbidity effects in two different scenarios: when the analyte has a weak influence on the Raman spectrum of water and when it has a strong influence. Changes in the Raman return associated with the OH stretching band of water are employed as a correction for strong scatterers, such as ammonium nitrate, which have little influence on water's Raman return. A direct measurement of turbidity is used as a correction for analytes which have notable impact on the Raman response of water. These corrective procedures enable quantitative Raman spectroscopic measurements of analyte presence in highly turbid waters. Similar procedures may apply to other liquid systems.

Advantages:

-Allows for the quantitative Raman analysis in turbid aqueous solutions

-Enables in situ analysis

Potential Applications:

Technology ID

2014-SINF-66635

Category

GreenTech/Water & Resource Management

Biotechnology & Life Sciences/Analytical & Diagnostic Instrumentation

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-Drinking water analysis

-Surface water (e.g., rivers, streams, lakes, reservoirs) analysis

-Wastewater analysis

-Industrial process analysis

-Laboratory analysis

-In situ analysis

TRL: 4

Intellectual Property:

Provisional-Patent, 2014-01-15, United States | Utility Patent, 2015-01-15, United States

Keywords: Raman spectroscopy, turbidity correction, aqueous analysis, water analysis, in situ analysis, quantitative Raman, suspended solids, liquid systems, drinking water analysis, wastewater analysis, surface water analysis, Chemical Processing, Chemistry and Chemical Analysis, Raman Spectrometry, Water, Water Testing