

Instant measurement for chemical concentrations in liquid with dispersive and nondispersive optical spectroscopy

Keywords:

- Non-contact; aqueous; concentration; titration; on-site detection; in-line monitoring; fast screening; electroplating; beverage
- Raman spectroscopy; Fluorescence spectroscopy; absorption spectroscopy; nondispersive detection; optical pulse; LED array

Problems addressed

- Instant liquid measurement is essential in both industrial manufacturing and people's daily life;
- Conventional titration requires manual sampling, experimentation, and data recording, for which the feedbacks are delayed and unreliable;
- Automatic chemical titration instruments are bulky and expensive. They consume specific chemical agents and create wastewater discharges.

To address the above issues, ASTRI developed a series of optical detection systems for instant measurement of chemical concentrations in liquid. They are fast and clean, covering a broad spectrum of applications involving on-site liquid measurements.

Innovations

Such an Optical Detection System includes the modules of liquid container, optical sensor, data processing, and data transmission.

- The liquid can be measured by specially designed flow cells, or through common transparent containers, or from above of liquid surfaces;
- Depending on the needs of the application, alternative spectroscopy techniques, namely Raman, fluorescence, absorption, non-dispersive LED-array, etc., are selectively integrated into the optical sensors;
- The excitation light sources cover the spectral range from UV, Visible, Near-IR, and SW-IR. i.e., from 0.25 μm to 2.50 μm ;
- The chemical concentrations are determined through the algorithms based on multivariate analysis tools together with the relevant database of accumulated liquid samples;
- Wired serial communication supports RS232 & RS285, and the wireless ports support WiFi, Bluetooth, and LoRa.

Key impact

- Fully-automatic and cost-effective in-line monitoring system for industrial water measurement, facilitating industry 4.0;
- Non-contact optical sensing system for durable and reliable surface water monitoring in harsh environment;
- Compact design with simple installation and operation for on-site residence water inspection;
- Convenient personal handheld liquid sensing device for beverage & health products fast screening.

Innovation snapshot



Project completed

- 26/12/2018; 31/03/2021; 31/05/2021.

Applications

- Industrial water measurement
- Surface water monitoring
- Residential water inspection
- Beverage & Health product fast screening

Patent(s)

- Docket number: P06600E
- US application No. 16/256455
- CN application No. 201980000295.3
- PCT application No. PCT/CN2019/073582

Commercialisation opportunities

- IP licensing
- Technology co-development

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