

IFPAC



Robust fiber-optic spectroscopy tools for process-control in-line using 4 spectroscopy methods in broad spectral range 0.3-16 μ m

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Info

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Primary Presenter Name:

Viacheslav Artyushenko

Co-Authors:

Alexander Novikov, Tatiana Sakharova, Alexey Bocharnikov, Elena Feliksberger

art photonics GmbH, Berlin 12489, Germany

Abstract:

Here we present our latest fiber-optic techniques that provide optical analysis of liquid, solid and gaseous media composition for remote process-control in-line. Robust fiber probes enable to run process monitoring in broad spectral range, including UV, Near-Infrared and Mid-Infrared regions. Depending on the industrial applications there are different fiber types inside the probe that are used for Transmission, Reflection, ATR-absorption, Raman & Fluorescence spectroscopies. Advanced fiber combi probes have been designed to use two or more spectroscopic methods in critical process points, e.g. Mid-FTIR+Fluorescence, Raman+Near-IR, Raman+Mid-FTIR, etc. – providing the synergy benefit from different spectral data fusion for better selectivity and accuracy in media composition analysis.

Thanks to the advanced design and recent advances in precision mechanics and optics, fiber optic probes are used in a variety of applications, including harsh environments, such as wide temperature range from -150°C to +250°C, high pressure up to 200 Bar or in vacuum, vibrations, aggressive liquids or gases, electromagnetic fields including microwave and hard radiation. On the other hand, fiber optic probes for medical applications are usually of a compact design and can even be in the form of a mono-fiber probes with a diameter less than 200 μ m that utilizes Raman spectroscopy, e.g., for malignant tissue diagnostics.

Complex samples and heterogeneous media may require an optical analysis where different spectroscopic methods are combined to achieve better accuracy. In this case, the capability of the combined methods to deliver complementary chemical information creates a synergy. In addition, the process can be investigated in the laboratory using all kinds of spectroscopy techniques. Based on the results, a customized sensor based on a few, but key informative spectral bands can be developed - with reduced size and cost, but with better performance.

Author

Viacheslav Artyushenko, PhD

President

art photonics GmbH