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Technologies for Optical Fiber Sensors

Erin Persil*

Department of Organic Chemistry, University of Murcia, Spain

Introduction

The idea that optical fibre technology may be beneficial in sensors has been around for more than 30 years. Indeed, the first patents on the issue predate Kao and Hockham's first predictions that fibres may play an important role in telecommunications. The "fotonic" sensor was created to measure locations and spacings in the machine tool industry, and its appeal was based on the combination of noncontact measurement and immunity to electromagnetic interference, both of which are currently included among fibre sensor technology's advantages [1].

Made the crucial insight that optical fibres may be helpful for transmitting phase information that could be tied to physical manipulation of fibre characteristics. The first definitive publications on optical fibre phase modulated sensors, particularly hydrophones and the gyroscope, were published in the mid-1970s, when fibre communications was beginning to seem competitive, and the beginnings of a realisation that these sensors had something unique to offer [2]. In the ensuing frenzy, optical researchers and technicians became persuaded that, like long-distance communications, the fibre optic media would control the globe, and electronics, with the exception of detecting electronics, would be doomed. However, unlike in the telecommunications industry, the excitement was swiftly tempered into realism as the optical conscience came to realise that thermocouples were a really excellent means to gauge temperature.

About the Study

Optical fibre sensors and fibre communications have the same core technical base, but that's where the similarities end. A big number of people perform the same thing in communication networks. Almost everyone wants something a little different when it comes to sensing and measurement. The sheer fact that fibres can carry more capacity than we can conceive over gigantic distances at a cost so low that it is becoming cheap has created an entire industry in telecommunications networks. Those that employ linear variable displacement transducers and pendulum inclinometers in sensing are familiar with, enjoy, and understand them. Most criteria of interest in industry, commerce, and the home environment may be assessed well using a half-dozen or more completely distinct methodologies. Fiber sensors seldom conduct "absolute" measurements, in which the output is directly related to the optical signal in the fibre. Other technologies, notably for chemical and biological measurands, must be used for high precision and stability [3].

Measurement issues, on the other hand, have a lot of advantages and rewards. For those of us who work in the field, the technological and economic difficulties are intoxicating. There are certain fascinating metrics that are currently insufficiently done and have enormous safety, environmental, security, or regulatory implications. Fiber optics, like every other "new" measuring technology, must first find the challenging niche that fibres can fill that no other technology can, and then develop a method to handle the challenges that arise inside that niche [4,5].

Conclusion

In the field of fibre sensor technology, there are countless examples of this happening. Fiber sensors have also shown to be cost competitive when compared to other established measuring methodologies, and fibres have made their mark in these fields as well. In an application analysis, this study will highlight several cases from both of these groups. But first, let's review the fundamentals of fibre sensors and relate them to the optical components that may be accessible as well as the measuring task at hand.

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***Address for Correspondence:** Erin Persil, Department of Organic Chemistry, University of Murcia, Spain, E-mail: epersil@odu.edu*

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