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Semiconductor-integrated-Fiber-Bragg-Gratings for multi-parameter network sensing

Shien-Kuei Liaw[1] and Chow-Shing Shin[2]
[1]National Taiwan University of Science and Technology, Taiwan
[2]National Taiwan University, Taiwan

Fiber sensing has been extensively used in several areas such as petroleum mining and vibration sensing, pressure, acceleration and flow, and strain and temperature measurement in composite materials for aircraft and helicopter structures. In a fiber-laser-based fiber Bragg grating (FBG) sensing system, the laser cavity forms part of the FBG sensor. Therefore, changes in the FBG physical condition can be detected directly through the laser wavelength. The fiber laser sensor dynamic range is equivalent to the cavity length. So far, most of the FBG-based fiber laser sensors have been constructed using commercial optical fiber amplifiers (OFAs), resulting in a limited number of lasing wavelengths and relatively large power fluctuations among multiple lasing wavelengthsdue to the OFA homogeneous broadening effect. The semiconductor optical amplifier (SOA) is an ideal alternative because of its inhomogeneous broadening property, which is beneficial to stable multi-wavelength lasing with equalized powers. SOA-based lasers have other important advantages for long-distance sensing, including fast response, a manageable emission band, low cost and a simple fabrication process. We investigate multi-wavelength SOA-based linear cavity fiber lasers in this work. With the SOA gain medium, we are able to demonstrate a multi-wavelength, long distance sensing technology using simple inexpensive elements.

Biography

Shien-Kuei Liaw received the PhD degree from National Chiao-Tung University, Taiwan. He joined the Telecommunication Laboratories, Ministry of Transportation and Communications, Taiwan. He was a visiting researcher at Bell core (now Telcordia), Red Bank, NJ, USA and a visiting Professor at University of Oxford, UK. He is now a distinguished Professor and the Director of Optoelectronics Research Center of National Taiwan University of Science and Technology, Taiwan. He has authored and co-authored over 200 international journal articles and conference presentations. His research interests include optical communication, fiber devices and fiber sensing.

skliaw@mail.ntust.edu.tw

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