

エルビウム添加光ファイバ中のブリルアン散乱と 蛍光を併用した歪・温度同時分離計測

Discriminative Measurement of Strain and Temperature Using Brillouin Scattering and
Fluorescence in Erbium-Doped Optical Fiber

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海外における研究活動状況

研究目的

Fibre-optic distributed strain and temperature sensor has been widely used in the field of structure health monitoring, such as bridges, tunnels, and buildings. Among several sensing scheme, Brillouin-based distributed sensing has been studied extremely these years. Brillouin-based sensor utilized the Brillouin scattering, which is linear dependent on temperature and strain, in the optical fibre to measure the strain and temperature where the optical fibre is located. One issue of this sensor is that when temperature and strain change at the same time, only by measuring the Brillouin scattering light is not enough to distinguish the strain and temperature information. In this work, we propose a novel methodology of discriminative measurement of strain and temperature by using fluorescence intensity ratio in erbium-doped fibre.

海外における研究活動報告

The International Conference on 'Optical Fibre

Sensors', OFS, is acknowledged as the world's leading conference on all topics related to photonic sensing technologies. The conference series is held every eighteen months, in rotation between North America, Europe and Asia. In 2014, OFS23 was held in Spain for the first time, from Monday 2nd to Friday 6th June in Santander, Cantabria. The conference has now passed its three decades and shows every sign of continuing to grow in importance and popularity. During OFS23, a total of 401 papers were presented and discussed, 68 in oral and 333 in poster format contributed from China, Spain, Germany, Italy, Japan and etc.

My presentation was arranged to the third poster session on 5th June. The title of my poster presentation was "Discriminative measurement of strain and temperature using Brillouin scattering and fluorescence in erbium-doped optical fibre". This paper shows a novel methodology of discriminative measurement of strain and temperature by using fluorescence intensity ratio FIR in an erbium-doped fibre. The ratio of the fluorescence power at 1565 nm to that at 1530

nm was employed as the FIR in this experiment, which was found to be independent of applied strain. Strain and temperature change estimated with this technique (0.37% and 19.4°C) agreed well with the practical values (0.4% and 20°C). The next important challenge is to render this sensor distributed, referring to some techniques proposed to perform distributed Brillouin measurement.

The presentation time lasted for about one hour and a half. I not only introduced the research but also have several impressive discussions with researchers from all over the world. Besides, I also took some time to visit other poster presentation, which deepened and widen my vision

on optical fibre sensor. The OFS23 committee provided the conference participants with exciting tours, including city sightseeing, the Nature Park Cabarceno, and the National Museum of Altamira. We greatly appreciate the support and contribution from The Murata Science Foundation to my presentation in OFS23.

この派遣の研究成果等を発表した
著書、論文、報告書の書名・講演題目

M. Ding, Y. Mizuno, and K. Nakamura, “Discriminative measurement of strain and temperature using Brillouin scattering and fluorescence in erbium-doped optical fiber”, Proc. SPIE 9157, 23rd International Conference on Optical Fibre Sensors, June 2, 2014.