Detachable Light-Induced Self-Written Optical Waveguides

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For future autonomous driving, it is necessary to develop high-speed in-vehicle optical network system. Recently, we have realized flexible light-induced self-written (LISW) optical waveguides and optical self-couplings between step-index optical fibers with 980 μm core [1] and graded-index optical fibers with 50 μm core (50GIFs) [2] to solve the problem of optical coupling under vibration conditions. In this study, we designed a flexible LISW optical self-coupling between graded-index optical fibers with 50 μm core using a material with self-healing characteristics, and demonstrated that reconnection of the waveguide was achieved after disconnecting the waveguide. In the in-vehicle optical network, repeated disconnection and reconnection are actually required and the result is useful for such applications.

In this study, we designed a LISW optical self-coupling between 50GIFs (Fig.1 Left) using self-healing material, and demonstrated that repeatable reconnection of the waveguide was achieved after disconnecting the waveguide (Shown in Fig.1 Right).

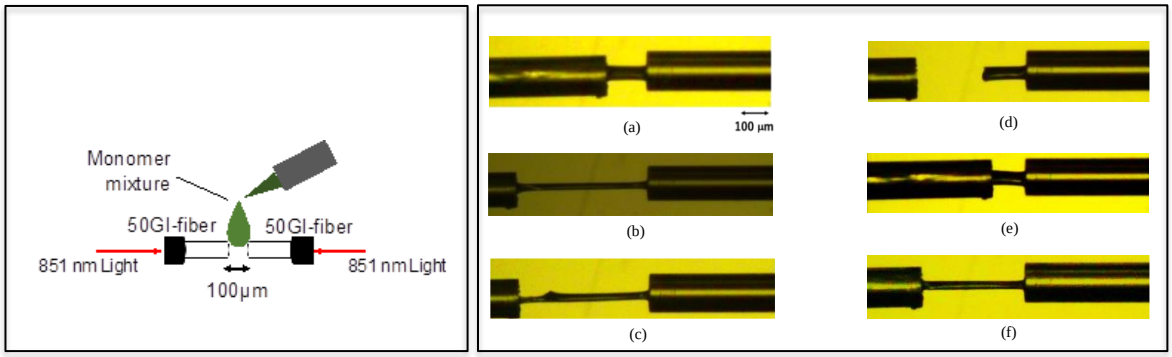

Fig.1_Left Experimental setup for bidirectional laser irradiation. Fig.1_Right Microscopic image of flexible LISW optical waveguide during disconnection and reconnection process.

References
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[2] R. Futawatari, H. Terasawa, and O. Sugihara, Appl. Phys. Exp., 17, 022003 (2024).3] A. Harada, R. Kobayashi, Y. Takashima, et al.. Nature Chem., 3, 34–37 (2011).

Short biography:

Makiko Ichioka was born in Utsunomiya, Tochigi, Japan, in 1975, graduated from the Department of Applied Chemistry, Faculty of Engineering, Utsunomiya University, in March 1999, and entered the Graduate School of Engineering, Utsunomiya University, in April 1999. 1999, joined Johnson Matthey Japan. In 2019 moved belongs to Muro Corporation.