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Nippon Electric Glass Co., Ltd.

**Successful development of the world's smallest optical isolator for high power fiber lasers,
using magneto-optical glass**

Nippon Electric Glass Co., Ltd. (Head Office: Otsu City, Shiga Prefecture, President: Motoharu Matsumoto) has successfully used magneto-optical glass to develop the world's smallest optical isolator for high power fiber lasers. The newly developed magneto-optical glass has approximately twice the magneto-optical performance of conventional materials, so it succeeded in creating higher performance optical isolators and also achieved a great reduction in size.

The use of fiber lasers for the marking and micromachining of various materials has spread in recent years. However, on these laser devices, there is a risk that the laser light reflected from the object may make the light source unstable or damaged. A device called an optical isolator is therefore used to block that returning laser light. The majority of these high power fiber lasers are currently in the 1 μm wavelength band and have 1W or greater output. The magneto-optical material used on the optical isolators for these lasers is single-crystal terbium gallium garnet (TGG: $\text{Tb}_3\text{Ga}_5\text{O}_{12}$). However, the issues for TGG include its low magneto-optical performance and the fact that internal strain during its manufacturing makes material sorting necessary and leads to unstable quality.

We have now developed a glass that has the highest magneto-optical performance in the industry, with approximately twice the performance of the conventional single-crystal TGG. Moreover, we also developed all of the optical parts and materials used on the optical isolator in-house. This has led to the successful development of an optical isolator that has high performance whilst also being the smallest in the world. It is also possible for glass to achieve the improvement of uniformity and removal of internal strain during manufacturing, so it has stable quality and is suitable for mass production. As a result, we are able to expect great advantages for the optical isolators in terms of both their quality and supply.

Outline

1. Advantages of the newly developed optical isolators

- Downsizing

The installation area can be downsized to half or less that of conventional products, and this increases the flexibility in the laser device design.

- High performance

The incident light loss is 0.1 dB or less and the isolation is 38 dB or higher (reference values).

- Support for higher power

A high laser damage threshold can be achieved through the use of high performance glass parts and materials developed in-house.

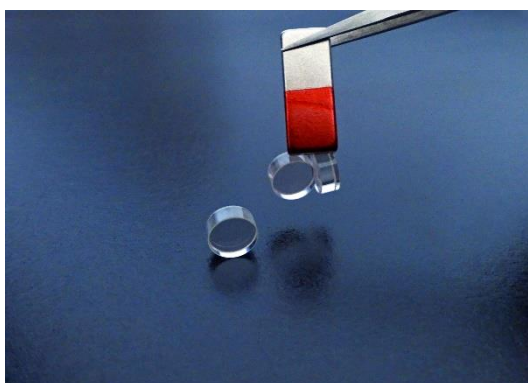
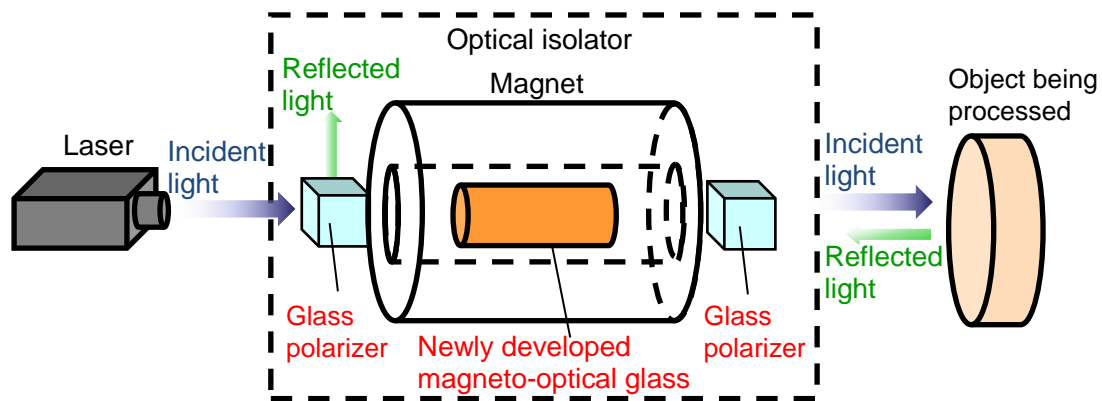
- Covering a wide range of wavelength regions

It has magneto-optical properties that are better than those of TGG with high transmittance achieved not only in the 1 μm band, but throughout the wavelength regions from ultraviolet to near infrared.

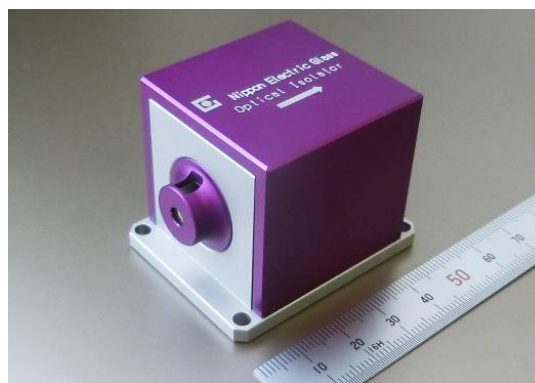
2. Commencement of sample shipping: November 2018

Reference

(Structural diagram of optical isolator)



Magneto-optical glass
(It is a magnetic material, so it sticks to magnets)



Developed optical isolator
(L51 × W40 × H40 mm)

(Conceptual image of downsizing)

