

# Physics Colloquium

Michigan Technological University

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Room 139 Fisher Hall



## Optical Isolator: Application to Photonic Integrated Circuits

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**Abstract:** Optical active devices fail to operate in a pre-determined manner, when unwanted reflections are launched into them. An optical isolator plays an essential role in protecting optical devices from unwanted reflections. Commercially available optical isolators based on a magneto-optic Faraday effect, which are provided with optical fiber and optical beam interfaces, are hard to be integrated with other optical devices.

In case of waveguide isolators, it is quite unrealizable to use a rotation of polarization, because the precise control of waveguide birefringence is needed. Several approaches have been developed to avoid the precise control of waveguide geometry, like a nonreciprocal radiation and a nonreciprocal loss isolator. An interferometric waveguide isolator, which uses a nonreciprocal phase shift provided by the first-order magneto-optic effect, has the advantages of a single polarization operation and a wide operational wavelength range. Also, the interferometric isolator is realizable in several waveguide platforms by using a magneto-optic material in a cladding layer. To achieve this, we developed a direct bonding technique of magneto-optic garnet on III-V compound semiconductors and silicon waveguides. In this talk, the integration of optical isolators will be addressed, which includes a non-magneto-optic approach.

**Bio:** Tetsuya Mizumoto received the B.E., M.E., and D.Eng. degrees in electrical engineering from Tokyo Institute of Technology, Tokyo, Japan, in 1979, 1981, and 1984, respectively.

Since 1984, he has been a Research Associate at Tokyo Institute of Technology. Currently, he is a Professor with Graduate School of Science and Engineering, Tokyo Institute of Technology. His research has been concerned mainly with waveguide optical devices, especially magneto-optic devices and all-optical switching devices based on the third-order nonlinearity.

Dr. Mizumoto received the Treatise Award in 1994 and the Best Letter Award of Electronics Society Transactions in 2007 from the Institute of Electronics, Information and Communication Engineers (IEICE). He is a Fellow of IEICE, a senior member of the IEEE, a member of the Japan Society of Applied Physics (JSAP) and the Magnetic Society of Japan (MSJ). He is awarded an IEEE Photonics Society distinguished lecturer award in July, 2009.