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Pioneering Study on Optical Modulators

Several key devices were required for the realization of optical communication, and a technology to put information on light, that is, an optical modulator was one of the key devices. In the 1960s, various optical crystals were developed. In the latter half of the 1960s, studies were carried out about the electro-optical effects of compound semiconductor crystals and bulk type optical modulators. And then, in the 1970s, research and development into optical waveguide devices were mainly promoted, and this research contributed to the realization of optical communications. In the 1980s, studies on LN modulators for phase modulation were promoted. In addition, in the trend of high-capacity optical communication systems after the 1990s, LN modulators contributed to the realization of phase modulation and multilevel modulation as an indispensable base device.

LN: Lithium Niobate

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Pioneering Study on Optical Integrated Circuits

To integrate optical circuit in the plane, monolithic integrated optics is one of the effectual measures toward downsizing and low power consumption and is one of the important properties of compound semiconductor optical devices. In optical integrated circuits, the major part is the amplification part including the light source. Y. Suematsu, et al., integrated semiconductor lasers—a source of light, several optical amplification function parts, and a light detector into one and realized a prototype of an optical integrated circuit before others and established the base of the optical integrated circuit. Meanwhile, A. Sasaki proposed the method to realize optical function elements which made it possible to operate the light excitation switch and optical bi-stability. For the stability behavior of the optical circuit, the optical non-contrariety element is indispensable and for the realization of optical integrated circuits, a waveguide-type optical non-contrariety element was required. T. Mizumoto developed a solid base for large-scale integrated circuits by realizing the integrated optical non-contrariety element on compound semiconductors.