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Development of Optical Fibers

While optical fibers was spreading, optical waveguide theory based on the numerical analytical approach to optical wave guides such as the finite element method and beam-propagation method and the equivalent circuit theory was constructed by M. Koshiba and applied accordingly. For optical fibers for FTTH, the optical fiber stood for a small bending of 5 mm radius with a structure having holes by K. Nakajima, et al. and selfox-fiber multicomponent-base glass by I. Kitano was applied to the micro-lens of the optical component, thereby making a considerable contribution. Polarization-preserving optical fiber typified by PANDA by T. Okoshi was an important technology which realized the polarization of multiple technologies indispensable for the realization of high-capacity optical communication.

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Rare-earth-doped Optical Fiber Amplifiers

One of the technologies that became the core of the current high-capacity transmission of 10 Tbps was the rare-earth-doped optical fiber amplifier. M. Nakazawa and K. Hagimoto were the first in the world to propose a method to use semiconductor lasers as the light source to excite erbium-doped silica-based fibers and then succeeded to get a transmission gain of 12.5dB in the 1.5μm band, in the low loss wavelength domain of optical fiber. This opened the door to the compact amplifier. Then, high reliability/high output power of semiconductor lasers was achieved by A. Kasukawa, et al., through improvements—strain adjustment quantum well structure, optimization of doping amount, and end plane protection structure, and thus the optical amplifier was upgraded to the level of practical use. Furthermore, a broadband optical amplifier exceeding the 100nm band was realized by S. Sudo, et al., by combining the erbium-doped tellurite optical fiber amplifier and the thulium-doped optical fiber amplifier.