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Research and Development on Planar Lightwave Circuits

Today's explosive spread of the internet is supported by optical fiber transmission technology which is able to provide high-capacity transmission areas at a moderate price. WDM transmission systems can be pointed out as one of the technologies for the sophistication of high-capacity transmission areas. Many optical branching circuits and optical transmitters and receiver circuits were required for WDM transmission systems, realizing optical circuits with wavelength filters. However, these wavelength filters were expected to realize a plane optical waveguide on which strict conditions are laid down such as narrow channel spacing, and low crosstalk. M. Kawauchi, et al., established design technology/production technology for silica-based plane optical waveguides. As a result, inexpensive high-tech plane optical waveguides were put to practical use. Later, using this plane optical waveguide, arrayed waveguide granting (AWG) which enabled the gathering/separating of many waves and contributed to the development of WDM transmission systems.

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Research and Development on Hybrid Optical Integration

Along with the sophistication of hi-capacity communication and the high speed, integration of functional components became necessary. This sophistication was expected, while low power consumption and downsizing were indispensable as well. Accordingly, conventional bulk-type integration technologies couldn't meet such demands. N. Uchida, et al., proposed hybrid optical integration where the PLC platform had both silica-based planar light circuit (PLC) functions and built-in optical elements as a communication device for access network systems. In addition, I. Ogawa, et al., realized vertical integrated circuits with photodetectors by integrating micromirrors with PLC platforms. These proposals of integration technologies contributed to the base technology for the downsizing of transmitters.

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Creation of Nano Photonics and Pioneering Study

The miniaturization of optical devices and observation technologies exceeding analytical limits were big themes as new technologies to break through the limits of optical

technologies. For the purpose of the miniaturization of optical devices, M. Ohtsu generated near-field light and developed the fiber probe as a basic device for screening and detection. And then he applied this technology to the single-molecule measurement of DNA, and to the light dispersion of single quantum dots of semiconductors, thereby established nano photonics.