HIKARI Router to Support the Future Massive-Capacity Internet Backbone

The growth of the Internet in recent years and its rapid permeation of society have led to an explosive increase in data traffic. Dealing with this massive upsurge in additional traffic calls for a revolutionary new kind of network system based on cutting-edge technologies never seen before. These developments will clearly be based on our optical technology. Optical signals are delivered over a massive-capacity photonic network using wavelength-division multiplexing, the signals are switched as light (without conversion to electric signals) using optical cross-connect technology, and then delivered to their proper destinations. By incorporating these optical technology advances that have evolved in recent years into IP routing technology, we have come up with an ingenious router based on a new concept—the photonic router.

We at NTT Laboratories have dubbed this the HIKARI router, and are now engaged in a full-scale effort to develop and deploy it. The accompanying figure shows how the HIKARI router fits into the network topology. Massive incoming data traffic to the IP router section of each router is delivered over the photonic network as optical signals until it smoothly reaches its intended destination router on the other end. NTT’s HIKARI router was recently demonstrated at Supercomm 2001, the telecommunication industry’s premier event of the year. With its ability to handle the equivalent of 5 Gp/s and optical signal processing of up to 2.56 Tbit/s, the HIKARI router has enormous transmission capacity. The demonstration system at Supercomm consisted of two HIKARI routers connected by two optical fiber links. A series of typical operations were demonstrated—massive-capacity transmission, optical path setup and teardown, and switching over to another path in the event of failure—and the router won high praise from industry insiders and other observers for its advanced capabilities and rock-solid operating stability.

We believe the HIKARI router will make a major contribution to the more productive and fruitful information distribution society that is now unfolding, and are now working to enhance its functionality while reducing its size and cost.

Development of STP Technology for Manufacturing Advanced System Devices

Research and development of LSI and MEMS devices with layers of various functions as advanced system devices proceeds with the aim of improving security in communication networks and achieving a next-generation large-capacity photonic network. Here, planarization technology for the surface of a device is needed for stacking various functions and MEMS on a CMOS LSI. The forming of thick films and cavity structures for MEMS is also necessary, but there is no technology for this purpose at present.

Against the above background, NTT Laboratories have proposed STP as a practical low-cost fabrication method for achieving thick-film formation and planarization simultaneously, and are moving forward with the development of associated equipment and process technologies. The STP method consists of technology that can planarize a dielectric film while forming a thick film on the wafer. It accomplishes this by (1) coating a dielectric film on a base film using a spinner or similar, (2) arranging the target wafer opposite the base film and applying pressure and heat in a vacuum, and (3) peeling off only the base film in air. This method makes it easy to seal in a cavity structure in MEMS.

In terms of equipment technology, we have succeeded in developing equipment to perform the sequence of coating, drying, transferring, and peeling, and as process technology for the coating of dielectric films, and we have developed surface-processing technology and technology for enabling general-purpose materials to be applied. Application of the above to the manufacturing of next-generation fingerprint sensors has enabled us to seal in a cavity structure for sensing a fingerprint on a LSI. This sensor is expected to contribute to the expansion of ubiquitous services that can perform sensing regardless of the usage environment.

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* MEMS: Micro Electro-Mechanical Systems
* CMOS: Complementary Metal-Oxide Semiconductor
* STP: Spin coating film Transfer and hot-pressing

Principle of STP

SEM photograph of MEMS fingerprint sensor LSI