

HIGH-DENSITY OPTICAL MEMORY RESULTS IN LICENSING AGREEMENTS

High-density data storage systems, essential to the survival of today's information-oriented companies, are some of the hottest items in the \$20 billion computer storage device market.¹ Magnetic floppy disks and optical compact discs temporarily meet some of this demand, but companies still search for higher density technologies to store the flood of data that drives their business processes.

Researchers at Oak Ridge National Laboratory (ORNL; Oak Ridge, TN) developed a high-density optical memory with about 100 times more storage capacity than previous technology. Called surface-enhanced Raman optical data storage (SERODS), this technology offers benefits for virtually any application requiring vast data storage, such as optical archive storage for libraries or insurance companies or data banks for financial institutions. Two companies are now commercializing the high-density optical memory through licensing agreements with ORNL and its operator, Lockheed Martin Corporation.

The first licensee, World Library, Inc., created a new company called SEROTECH, Inc., to develop compact disc read-only memory (CD-ROM) and read/write CD products based on SERODS. World Library specializes in publishing text-based, interactive CD-ROM products and expects SERODS to increase the storage capacity of its products by 1,500 percent. The second licensee, Photronix, Inc., also spun off a new company, called CDEX[®] Corporation, to market its future SERODS products, such as a rewritable CD-ROM called CDE[®], a video cube, and a digital still camera with optical card.

Current CD-ROMs have a storage capacity of up to 600 megabytes (600 million bytes), or the equivalent of 270,000 pages of typewritten text. However, a 12-inch CD using SERODS technology contains roughly 100 times more storage. This capacity could store 18,000 sets of the Encyclopedia Britannica, the name of every taxpayer registered with the Internal Revenue Service, or all the records on a U.S. Navy ship. With further development, SERODS could store as much as 1,000 times more information than fits on today's disks.

BMDO originally funded SERODS research to develop an alternative technique for optically storing massive amounts of computer data. Although designed as write-once, read-many-times (WORM) technology, SERODS writes, reads, and deletes. Layered SERODS disks could allow 3-D data storage. This unique feature would permit simultaneous scanning of multiple tracks or layers, leading to improved data transfer rates.

ABOUT THE TECHNOLOGY

SERODS is based on the principle that the surface-enhanced Raman scattering (SERS) properties of certain molecules embedded in an optical medium can be altered to store information. The SERODS system uses a writing laser, a reading laser, a photometric detector, and an optical disk or a 3-D multilayer optical storage medium. The writing laser encodes bit information by altering the light-emitting properties of specific clusters of molecules on the disk, while leaving other molecules intact. The reading laser excites all the molecules in the disk's optical layer, including specific microregions of the disk, to produce altered and unaltered SERS light signals that correspond with "one" bits and "zero" bits, respectively. The photometric detector tuned to the frequency of the Raman emissions retrieves the stored information.

. . . a high-density optical memory that could hold 18,000 sets of the Encyclopedia Britannica on a single 12-inch optical disk.

TWO COMPANIES, WORLD LIBRARY, INC., AND PHOTRONIX, INC., HAVE ACQUIRED LICENSES FOR SERODS TECHNOLOGY.



■ Dr. Tuan Vo-Dinh of ORNL operates the SERODS optical data storage system, which offers about 100 times greater storage capacity than previous technology.

¹Marketplace Information Holdings, Inc. 1996. Market analysis report: Computer storage devices. World Wide Web at <http://www.imarketinc.com/anly/reports/rpt3572.htm>.