

A special issue on *Optical Storage*

Xiangshui MIAO (✉)

Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, Wuhan 430074, China

© Higher Education Press and Springer-Verlag Berlin Heidelberg 2014

The use of optics for data storage could trace back to 40 years ago when the researchers explored the possibilities of optical technology to record and playback audio signals. Optical storage devices have great advantages in low cost, high reliability and good compatibility, which make them suitable for data backup, digital publications, audio & visual products, and so on. To meet with the increasing demand for information storage in the era of big data, optical storage technologies are actively involved in continuous improvement of ultra-high densities and data transfer rates. Several promising technologies have gained growing interest, such as holographic data storage (HDS), multi-layer optical storage, multi-dimensional optical storage and super-resolution near-field structure (super-RENS) optical storage, they are with great expectations because they utilize the volume of optical materials to store information and show great potentials in capacity, density and speed. These technologies, emerging with the revival of optical storage, are now providing a platform for people from both academic and industrial fields to overcome the challenges and realize the practical applications for next generation optical data storage in near future. In this “Special Issue on *Optical Storage*”, 5 review articles and 3 research articles are specially presented, which covers the research frontiers in relevant subjects.

In the review articles, Dr. Naoyasu Miyagawa from Panasonic Corporation gave an overview of the research and development progress on Blu-ray disc (BD) for more than 20 years, and presented the key technologies in optical disc system, rewritable media, recordable media, multi-layer media. Prof. Xiaodi Tan at Beijing Institute of Technology introduced high density collinear HDS system, both media structure and recording methods of HDS are discussed. Prof. Hao Ruan at Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences reviewed the major achievements of HDS in the past 10 years and discussed about the key technologies and challenges. Prof. Yiqun Wu at same institute reported the progress of super-RENS and its application in optical data storage, analyzed and compared various types of super-RENS technologies, concluded the aperture-type media as the most suitable candidate. Prof. Changsheng Xie at Wuhan National Laboratory for Optoelectronics proposed the optical storage as an emerging option for long-term digital preservation, compared optical media based solutions with magnetic media, and summarized the techniques to improve the optical media based archive system.

In the research articles, Prof. Yuzuru Takashima from University of Arizona in USA reported optical design in high density and high capacity multi-layer data storage system, and demonstrated sufficiently small as-built wavefront error (less than 0.1 waves) while implementing the focusing and tracking capabilities. Prof. Din Ping Tsai at Taiwan University studied the feasible concept of high density optical data storage by employing plasmonic resonances in metallic nano-structures and demonstrated information storage through the modulation of amplitude and phase of light. Prof. Jing Pei at Tsinghua University presented a novel multi-dimensional optical storage reading strategy, the readout rate could be increased by 10 times over the traditional disc.

All the excellent works from the authors are appreciated and we hope these selected articles can serve as enlightenment and guidance to arouse the readers' interests in optical data storage.



Professor **Xiangshui Miao** was awarded with a Bachelor degree in 1986, a Master degree in 1989, and a Ph.D. degree in 1996 from Huazhong University of Science and Technology (HUST). In 1989, he joined this university as an Assistant Professor, a Lecturer in 1991 and then an Associated Professor in 1994. In 1996, he worked in City University of Hong Kong as a Research Associate and then a Research Fellow. In 1997, he joined Data Storage Institute in Singapore as a Senior Research Engineer, and was promoted to Principle Research Engineer and Research Scientist (Grade: 4). He is currently a Chang Jiang Professor (MOE) and the department head of Microelectronics in Huazhong University of Science and Technology, and the Institute director of Information Storage Materials and Devices in Wuhan

National Laboratory for Optoelectronics.

He won the Singapore National Technology Award in 2004, and China's National Award of Science & Technology Development in 1998 and 1992. He has authored and co-authored over 200 scientific papers, in which more than 100 papers were collected by SCI. He has applied more than 60 patents.

His current research interests include phase change memory, memristor/RRAM, optical storage media and magnetic media.