

PREFACE

Information storage has been becoming an essential issue in this digital age. The past couple of decades witnessed the explosive increase of the capacity of the information and the remarkable miniaturization of electronic devices. Those trends continue to demand new recording technologies and materials that could combine the virtues of high density, fast response, long retention time, and re-writing capability. They aim at overcoming the current physical limitations in memory device components.

The research on information storage is highly interdisciplinary as various disciplines are involved, like physics, chemistry, materials, and electrical engineering. The realization of high density data storage relies on the clear understanding and effective integration of functional material, assembly techniques, device fabrication and recording mechanism. In recent years, tremendous progress has been made in magnetic/optical/electrical data storage. The development of scanning probe techniques enables the realization of nanometer even molecular scale data storage. Recent insight into the multi-mode data storage on multi-responsive molecules will undoubtedly initiate new horizons for the future data storage, and will also bring on new applications and research fields. In multi-mode data storage, multiple physical-channels like optical, electrical and magnetic multifunctionality are simultaneously involved for recording and transmitting information. The synergetic effect of different channels as well as characteristics in multi-responsive recording media can be intensively exploited. As far as recording medium is concerned, a molecule, which undergoes different transformations with the type of external stimuli, can be expected having significant applications in high density data storage and complex information processing.

This book reviews extensively the most recent achievements on high density data storage based on magnetic, optical, or electrical bistability,

with emphasis on the advances of nano or molecular-based recording materials and technologies. Particular attention was paid to the motivation and the design of new materials and their recording mechanism, which represent some of the most exciting results in this field. Finally, the emerging technologies as well as the future development of high density data storage have also been discussed.

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