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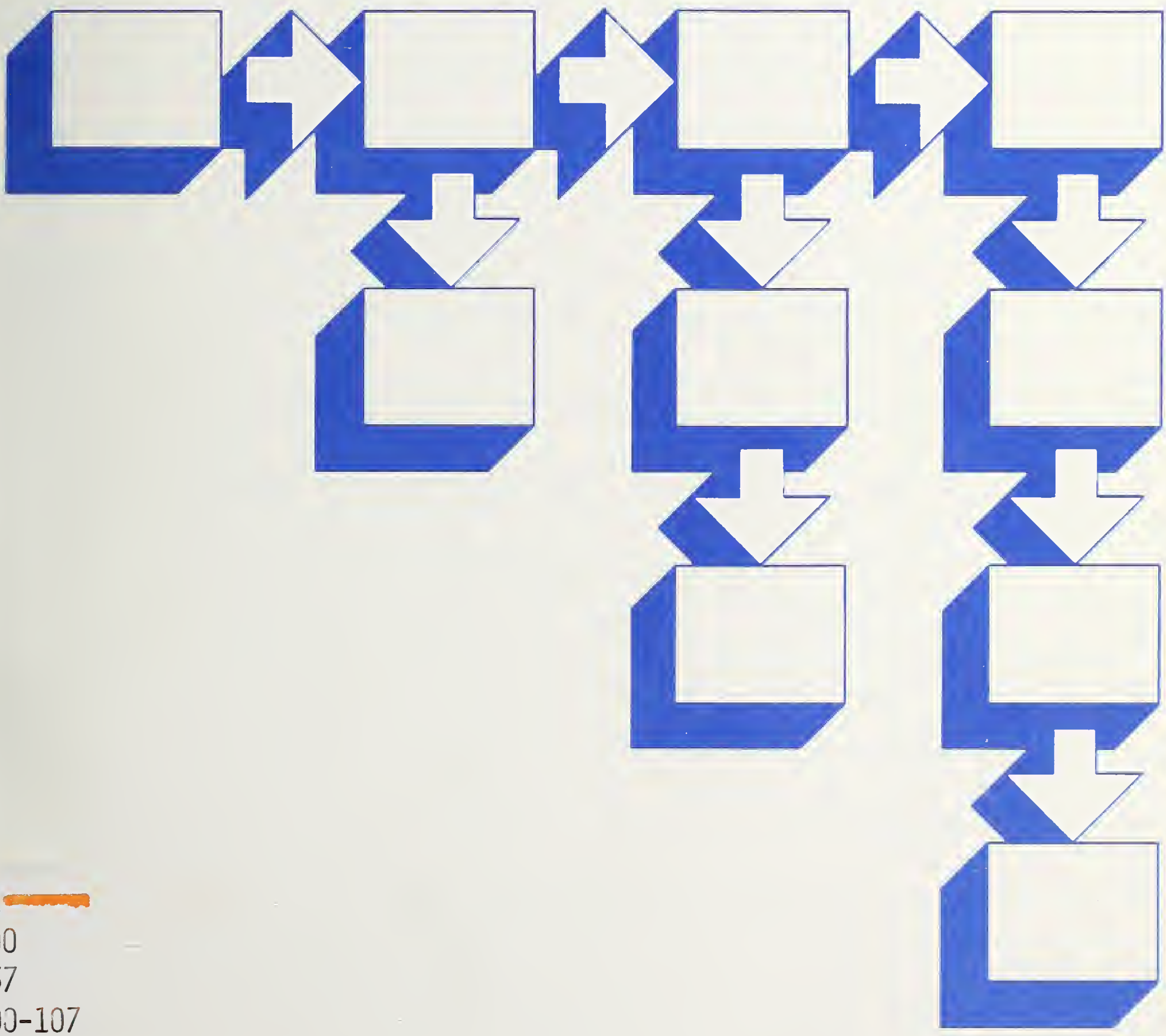
Computer Science and Technology

NBS Special Publication 500-107

A Bibliography of the Literature on Optical Storage Technology



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Computer Science and Technology

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A Bibliography of the Literature on Optical Storage Technology

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A BIBLIOGRAPHY OF THE LITERATURE ON OPTICAL STORAGE TECHNOLOGY

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A BIBLIOGRAPHY OF THE LITERATURE ON OPTICAL STORAGE TECHNOLOGY

James R. Park

ABSTRACT

This bibliography contains nearly 700 references related to optical storage and retrieval of digital computer data. The citations are divided into two major groupings: General Literature and Patent Literature Documents. Annotations are provided under the General Literature for many of the references in the critical area concerned with the media used for the optical recording and playback of optical digital data disks. The documents have been classified into several broad categories for the user's convenience. Access to the individual citations for each category is obtained through cross indexes which facilitate the rapid selection of pertinent articles. In addition to the categorical classifications, several other indexes are included in this bibliography.

KEY WORDS: bibliography; computer disk; magnetooptic materials; optical computer disk; optical data disk; optical digital data disk; OD^3; optical disk; optical storage; video disc.

1.0 INTRODUCTION

Within a few years, it is expected that some type of an optical device will be utilized for the storage and retrieval of digital computer data. At this time however, there are no commercial devices available for this purpose. Early attempts at utilizing optical storage for computer data were not successful due to a variety of reasons, most notably the lack of a suitable recording medium. However, recent research has led to the development of satisfactory media and the promise of viable commercial systems.

This bibliography has been compiled to serve as a working tool for those who are involved in optical storage research, planning, and development. Since the recording medium plays such a critical role in these systems, some of the citations which are directly concerned with the optical storage media have been annotated.

This is a non-critical, non-selective bibliography; no attempt has been made to prejudge the value of the documents. It is the opinion of the author that errors of inclusion are much less serious than errors of omission, and within the available time span, every effort has been made to be as complete as possible. All documents cited in this bibliography have been obtained by NBS; however, the documents are not available from NBS for external use.

In order to increase the bibliography's usefulness and versatility, several indexes have been included.

A Classification Index can be used to search for papers on various topics such as magnetooptics, optics, thermoplastic recording, etc. The classification scheme is neither rigid nor exclusive. Some documents are indexed under more than one category. Other indexes lead to papers by particular authors or the papers produced by authors from a given organization. A Title Index is also included. Three indexes are given for the patent documents: a Patent Number Index, an Inventor Index, and a Patent Assignee Index. The citations have been made as complete as possible in order to facilitate the acquisition of desired documents. Document source names in the citations have been spelled out in their entirety in order to reduce the confusion which can arise from imprecise or unfamiliar abbreviations.

The principal information in this bibliography is concerned with the optical digital data disk (OD^3); and although there are several video disc and holographic storage citations, no attempt was made to actively search in these areas. A few documents have been cited for 1982, but the primary collection extends only through 1981.

2.0 HOW TO USE THIS BIBLIOGRAPHY

The bibliographic information for each document is contained in a citation which can be accessed through a callout. Each citation contains:

- The author's name(s)
- The document title
- The document source
- The publication date
- The number of references given.

Callouts are unique identifiers for the documents and their citations. Each callout consists of an author's name, one or two initials, and the year of publication--all enclosed in parentheses. In the event of multiple publications in the same year by the same author, letter suffixes following the year of publication are used for further identification. A typical callout is: (CHEN,D 70A); this designates the first paper published by Di Chen in 1970. Callouts for the patent documents are done in a similar manner using the inventor's name preceded by USP, for example (USP KLEINKNECHT,HP 79).

There are three groups of citations and within each group, the citations are arranged in alphabetical order based on the author's or inventor's names in the callouts. The largest group of citations is the General Literature Bibliography which contains the bulk of the bibliographic information. A companion group is the Annotated Media Bibliography containing citations which are identical to those found in the General Literature Bibliography but are accompanied by a short paragraph describing the major content and results presented in the document. The third group of citations is the Patent Literature Bibliography which contains bibliographic information relative to the patent documents.

HOW TO USE THE INDEXES

There are six general indexes which provide rapid access to document citations if some specific knowledge is known about a particular document. The Author Index enables the reader to find all of the cited documents which are attributed to a given author by searching for that author's name in the Author Index. When the author's name is found, one or more callouts will be associated with the name.

These callouts are then located in the General Literature Bibliography where the citations can be examined. Suppose that the reader desires to find the citations attributed to R. S. Mezrich. Look in the Author Index for Mezrich, R.S. and find the following callouts:

(LOHMAN,RD 71) (MEZRICH,RS 69) (MEZRICH,RS 70A)
(MEZRICH,RS 70B) (STEWART,WC 73).

This indicates that there are five papers attributed to R.S. Mezrich, three of which indicate principal authorship; i.e., Mezrich's name appeared first in the event of coauthorship. Two other papers for which Mezrich was a coauthor appear under the name of the principal author. One can now locate these callouts in the General Literature Bibliography and find the titles and source documents for these papers.

In a similar fashion, the papers sponsored by an organization can be found by looking for the organization's name in the Corporate Author Index and locating the citations in the General Literature Bibliography through use of the callouts associated with the organization's name. The Title Index, when consulted for a specific title, permits the reader to determine if the particular paper is included in this bibliography. If the title is indexed, there will only be one callout to be located in the General Literature Bibliography. The words "A," "An," and "The" were omitted in the process of alphabetizing the Title Index.

Access to patent citations is accomplished by using the Patent Number Index, Inventor Index, and the Patent Assignee Index. The procedure is similar to that for using the other general indexes. A specific feature; i.e., a patent number, inventor name, or a patent assignee, is searched for in the appropriate index and the callouts determined. These callouts are then located in the Patent Literature Bibliography for examination of the citations.

Another index, the Classification Index, serves a somewhat different purpose. It is used to find groups of documents associated with particular topics. In the Classification Index, there are a number of topical headings accompanied by groups of callouts. These callouts designate the papers in this bibliography which are related to the topic heading. Suppose the reader wishes to find the papers related to archival storage of digital computer data. The procedure would be to locate the Archival heading in the Classification Index and find the callouts

(AMMON,GJ 78) (AMMON,GJ 80) (BOSCH,MA 82)
(DREXLER,J 81) (GELLER,SB 74) (REDDERSON,BR 80B).

These callouts may now be used to locate the citations in the General Literature Bibliography. There is one exception to using the General Literature Bibliography: If the Media category is consulted, the callouts should be located in the Annotated Media Bibliography, where not only the citations will be found, but also descriptions of the papers.

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Wolff, Karin	(USP WOLFF,K 71)
Wong, Herman	(USP BECKER,CH 72B)

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3.6 PATENT ASSIGNEE INDEX

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(USP LIPPITS,GJ 81) (USP PEPPERL,R 78) (USP VANBUUL,MC 78)
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Victor Company of Japan, Ltd.
(USP OHNUKI,K 74)

Westinghouse Electric Corporation
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(USP KORPEL,A 70) (USP KORPEL,A 76) (USP RENNICK,JL 75)
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5.0 CITATIONS

5.1 MEDIA ANNOTATIONS

(AHN,KY 82) Ahn, K.Y., T.H. DiStefano, S.R. Herd, N.J. Mazzeo, and K.N. Tu. "High-Sensitivity Silicide Films for Optical Recording." Journal of Applied Physics. Vol. 53, No. 9, September 1982, pp. 6360-6364. 4 refs.

This recent paper gives the results of sensitivity experiments performed on a variety of substrates for bilayer and trilayer structures of silicide films. Techniques for reduction of laser writing power are tried and found to significantly reduce the power necessary for writing. Preparation of active films is discussed. Materials studied were: Rh, RhB, RhB-Si, and Al-SiO_2-Au-Si.

(AHRENKIEL,RK 73) Ahrenkiel, R.K. and T.J. Coburn. "Hot-pressed $CoCr_2S_4$: A Magneto-Optical Memory Material." Applied Physics Letters. Vol. 22, No. 7, April 1, 1973, pp. 340-341. 7 refs.

This paper describes investigations of hot-pressed $CoCr_2S_4$ for desirable characteristics regarding its potential use as an optical storage medium. Measurements of physical properties related to the Kerr and Faraday effects are made and two figures-of-merit are defined. One of these figures-of-merit is for the readout by the Faraday effect and the other is for readout by the Kerr effect. No information regarding recording density, writing power required, or writing rates is presented. It is found that hot-pressed $CoCr_2S_4$ has several properties which are useful in a thermo-magnetic recording scheme.

(AHRENKIEL,RK 74) Ahrenkiel, Richard K., Theodore J. Coburn, and Edward Carnal, Jr. "Magnetooptical Properties of Ferrimagnetic $CoCr_2S_4$ in the Near Infrared." IEEE Transactions on Magnetics. Vol. MAG-10, No. 1, March 1974, pp. 2-7. 12 refs.

The properties of hot-pressed $CoCr_2S_4$ are investigated and reported more extensively than was done in a previous paper (AHRENKIEL,RK 73). Some attention is in this later paper to the use of $CoCr_2S_4$ as an optical memory material. It is mentioned that the large magnetooptic effects occur at wavelengths for which commercial lasers are not available (circa 1974) and that cryogenic atmospheres are necessary.

(AISENBERG,S 81) Aisenberg, S., and M. Stein. "Novel Materials for Improved Optical Disk Lifetime." Beiser, Leo, ed. Proceedings of the Society of Photo-Optical Instrumentation Engineers: Advances in Laser Scanning Technology; August 27-28, 1981; San Diego, California. Bellingham, Washington: Society of Photo-Optical Instrumentation Engineers; 1981; Vol. 299: pp. 64-67. 6 refs.

While this article is not written about recording media per se, it is concerned with the protection of thin metallic films from oxygen and water vapor infiltration. A film of diamond-like carbon is deposited on the surface to be protected by using a plasma-ion beam deposition technique. The film provides hermetic protection due to the small interatomic spacing of carbon. Films about 800-1000 Angstroms (80-100 nm) thick are expected to act as a suitable oxygen barrier to prevent oxidation of protected surfaces. Some important characteristics of the protective film are: flexibility, good adhesion on many materials, good optical transmission and low absorption, and erosion resistance. The film is also an electrical insulator.

(ALLEN,TH 81) Allen, Thomas H. and Gary S. Ash. "Optical Properties of Tellurium Films Used for Data Recording." Optical Engineering. Vol. 20, No. 3, May-June 1981, pp. 373-376. 13 refs.

"The complex optical index of refraction for evaporated films of tellurium has been measured using ellipsometry over the wavelength range 439 to 633 nm. Values of n and k as a function of thickness are presented. The transmittance and reflectance of single layers of tellurium, as well as multilayer structures to be used for optical data recording media, are shown as a function of wavelength. Oxide formation of the films has also been measured, and a model for the role of oxides in altering adhesion of the films is presented."

(AMODEI,JJ 72) Amodei, J.J., W. Phillips, and D.L. Staebler. "Improved Electrooptic Materials and Fixing Techniques for Holographic Recording." Applied Optics. Vol. 11, No. 2, February 1972, pp. 390-396. 11 refs.

Improvements in the storage performance of lithium niobate and barium sodium niobate are reported in this paper. Enhancements are achieved by the introduction of transition metal impurities or by irradiating undoped crystals. These modified materials have increased sensitivity with diffraction efficiencies well over 50%. Fixing techniques permit nondestructive readout for phase-holograms stored in single thick crystals of lithium niobate and barium sodium niobate. Good quality storage is shown to exist for approximately five months. Estimates of storage times between five and fifteen years are predicted for samples stored at 0°C.

(ANDERSON,HR 71) Anderson, H.R., Jr., E.A. Bartkus, and J.A. Reynolds. "Molecular Engineering in the Development of Materials for Thermoplastic Recording." IBM Journal of Research and Development. Vol. 15, No. 2, March 1971, pp. 140-150. 4 refs.

Polymerization, testing, and preparation of thermoplastic media is discussed. Two types of recording tests were performed: One to determine the response characteristics of thermoplastics in air and the other to determine their characteristics in vacuo. Various polymers are studied and response characteristics are found to be affected strongly by the plasticizer content of the polymer. Coating thickness is an important factor in controlling the rate-of-response. Write-read-erase cycle testing is performed on various thermoplastics. Styrene-octyl-decyl methacrylate (85-15) copolymer film is subjected to 50,000 write-read-erase cycles with equivalent deformations being produced at the beginning and end of the cycling period. The thermoplastic recording properties of a polymer are found to be related to the polymer chemistry, molecular weight, and the degree and type of plasticization.

(ASH,GS 80) Ash, Gary S., and Thomas H. Allen. "Optical Properties of Tellurium Films Used for Data Recording." Jamberdino, Albert A., ed. Proceedings of the Society of Photo-Optical Instrumentation Engineers: Laser Scanning and Recording for Advanced Image and Data Handling; April 8-9, 1980; Washington, D.C. Bellingham, Washington: Society of Photo-Optical Instrumentation Engineers; 1980; Vol. 222: pp. 64-69. 13 refs.

Optical constants for tellurium at wavelengths ranging from 439 to 633 nm are measured and reported in this paper. Deposition of films is discussed and the theory of ellipsometry for the measurements is given. Measurements are made on film thicknesses in the range from 6 to 208 Angstrom units (0.6 to 20.8 nm). Adhesion properties of tellurium deposited on glass substrates are investigated and found to be poor but improved with aging. This is believed to be due to the formation of an oxide film at the interface. Measured values of reflectance and transmittance of single-layer tellurium films with a thickness of 250 Angstrom units (25.0 nm) are given as well as absorptance for a three-layer design.

(BARTOLINI,RA 76) Bartolini, R.A., H.A. Weakliem, and B.F. Williams. "Review and Analysis of Optical Recording Media." Optical Engineering. Vol. 15, No. 2, March-April 1976, pp. 99-108. 54 refs.

Optical recording materials are organized into eleven classes. Several materials for each class are tabulated and characteristics of the materials are provided. Some of the characteristics given are usable thickness, recording process, processing, recording sensitivity, and resolution. A procedure is described which facilitates choosing recording materials based on system requirements.

(BARTOLINI,RA 81A) Bartolini, R.A. "Media for High Density Optical Recording." DiStephano, T.H. ed Proceedings of the Society of Photo-Optical Instrumentation Engineers: Optical Storage Materials; November 18, 1980; Ossining, New York. Bellingham Washington: Society of Photo-Optical Instrumentation Engineers; 1981; Vol. 263: pp. 70-74. 11 refs.

This article begins with a list of advantages that optical disk recording systems provide. This is followed by a short description of a basic optical storage concept. Succeeding topics delineate the desired characteristics for optical recording media. A tellurium trilayer recording structure is then described. Sources of defects are discussed. A subbing layer placed over the substrate material can be used to minimize defects from one source.

(BARTOLINI,RA 81B) Bartolini, Robert A. "Media for High-Density Optical Recording." Optical Engineering. Vol. 20, No. 3, May-June 1981, pp. 382-386. 11 refs.

For annotation of this paper, see (BARTOLINI,RA 81A).

(BEESLEY,MJ 70) Beesley, M.J., and J.G. Castledine. "The Use of Photoresist as a Holographic Recording Medium." Applied Optics. Vol. 9, No. 12, December 1970, pp. 2720-2724. 6 refs.

This paper describes the use of pre-exposure or post-exposure techniques for reducing the exposure times required for storing holograms in a photo-resist material. The use of pre-exposure techniques can reduce exposure time to about 25% of the normal value. Pre-exposure also reduces the effects of stray light.

(BELL,AE 78) Bell, Alan E., and Fred W. Spong. "Antireflection Structures for Optical Recording." IEEE Journal of Quantum Electronics. Vol. QE-14, No. 7, July 1978, pp. 487-495. 23 refs.

Three optical recording structures are described: Monolayer structures, bilayer antireflection structures, and trilayer antireflection structures. It is found that the bilayer antireflection structures are of particular value for use with organic dye film recording media and that the trilayer structures are more appropriately used with metallic film recording media.

(BELL,AE 79A) Bell, A.E., and R.A. Bartolini. "High-Performance Te Trilayer for Optical Recording." Applied Physics Letters. Vol. 34, No. 4, February 15, 1979, pp. 275-276. 4 refs.

This is a report on the optical recording characteristics of a fully encapsulated tellurium trilayer structure. The tellurium trilayer structure maintains the 50 dB signal-to-noise ratio quoted for a titanium trilayer structure (BELL,AE 79B). Recording sensitivity of the tellurium is shown to be 4 times as great as for titanium. With this increased sensitivity, the tellurium trilayer can be optimized for recording with GaAs laser diodes which have a wavelength of approximately 800 nm.

(BELL,AE 79B) Bell, A.E., R.A. Bartolini, and F.W. Spong. "Optical Recording With The Encapsulated Titanium Trilayer." RCA Review. Vol. 40, No. 3, September 1979, pp. 345-362. 5 refs.

This paper concentrates on RCA's Encapsulated Titanium Trilayer optical recording disk. The design is described and substrates and encapsulation are discussed. One feature of this paper is that errors (detected dropouts) are shown for encapsulated and non-encapsulated disks for various states of surface cleanliness. Signal-to-noise ratios equal to or greater than 50 dB are achieved with this encapsulated titanium trilayer medium deposited on a plastic substrate. Recording beam power of 25 mW incident on the disk surface is employed in achieving this performance.

(BLOM,GM 79) Blom, G.M. "Single Te Films and Te Trilayers for Optical Recording." Applied Physics Letters. Vol.35, No. 1, July 1, 1979, pp. 81-83. 6 refs.

This paper compares the characteristics of single layer tellurium films with those of tellurium trilayer structures. Signal-to-noise ratios are enhanced by utilizing the trilayer antireflection structure. Thermal design is beneficial in optimizing the performance for optical recording. Tests were performed using a He-Cd laser with a wavelength of 4416 Angstroms (441.6 nm).

(BOOTH,BL 72) Booth, B.L. "Polymer Material for Holography." Applied Optics. Vol. 11, No. 12, December 1972, pp.2994-2995. 5 refs.

DuPont photopolymer film is subjected to several experiments relative to holographic storage. For most thicknesses of the film coated on glass, Kogelnik's criteria for volume holograms is satisfied. Various wavelengths of light for recording the holograms are employed with good results. Results of this experimentation enables optimization of dye concentrations and thickness for both sensitivity and peak diffraction efficiency.

(BORDOGNA,J 72) Bordogna, Joseph, Scott A. Keneman, and Juan J. Amodei. "Recyclable Holographic Storage Media." RCA Review. Vol. 33, No. 1, March 1972, pp. 227-247. 63 refs.

Several materials are investigated for their potential applicability as recyclable holographic storage media. The investigations are not limited to one writing or reading technique. Several techniques are used; e.g., magnetooptics, electrooptics, and plastic deformation. A figure-of-merit is defined for use as a guideline in the choice of holographic storage media.

(BORRELLI,NF 79) Borrelli, Nicholas F., and Peter L. Young. "New Thin Film Optical Recording Medium." Jamberdino, Albert A., ed. Proceedings of the Society of Photo-Optical Instrumentation Engineers: Laser Recording and Information Handling; August 27-28, 1979; San Diego, California. Bellingham, Washington: Society of Photo-Optical Instrumentation Engineers; 1979; Vol. 200: pp. 51-56. 3 refs.

An erasable film structure composed of a silver halide phase in contact with a chemically produced discontinuous silver phase is described and a mechanism is proposed to explain the induced optical anisotropy when the material is exposed to light from a polarized He-Ne laser. The polarized He-Ne laser is used as the writing and erasing source and a GaAs laser is employed for the readout source. Erasure is accomplished by re-exposing the recorded spot to a 45 or 90 degree rotation of the polarization direction of the write beam.

(BORRELLI,NF 80) Borrelli, N.F., and P.L. Young. "Read-Write-Erasable Thin Film Optical Recording Medium." Jamberdino, Albert A., ed. Proceedings of the Society of Photo-Optical Instrumentation Engineers: Laser Scanning and Recording for Advanced Image and Data Handling; April 8-9, 1980; Washington, D.C. Bellingham, Washington: Society of Photo-Optical Instrumentation Engineers; 1980; Vol. 222: pp. 48-53. 2 refs.

Writing, reading, and erasure on a silver halide thin film structure is shown to be possible in an earlier paper (BORRELLI,NF 79). This later paper presents recording data relevant to the writing sensitivity, the resulting contrast, and efficiency of erasing. The extent to which write-read-erase recycling can be done without degradation of the material is not determined.

(BOSCH,MA 82) Bosch, M.A., K.S. Kang, S. Hackwood, G. Beni, and J.L. Shay. "Optical Writing on Blue, Sputtered Iridium Oxide Films." Applied Physics Letters. Vol. 41, No. 1, July 1, 1982, pp. 103-105. 8 refs.

An interesting mechanism for optical writing on sputtered iridium oxide films is investigated. A laser beam is used to dehydrate the film where the beam is focused. A change in the film's microstructure occurs in the exposed region producing a change in its optical characteristics. Both electronic conductivity measurements and optical spectra support this dehydration theory. It is claimed that high contrast writing at low power is due to dehydration accompanied by film shrinkage. Due to the high stability of iridium oxide films this process seems promising for optical archival information storage.

(BRODY,H 82) Brody, Herb. "Materials for Optical Storage: A State-of-the-Art Survey." Journal of Micrographics. Vol. 15, No. 1, January 1982, pp. 33-37. No refs.

This article first discusses the impossibility of producing the ideal optical storage medium and then moves on to discuss the characteristics required for a suitable recording medium. Several classes of recording media are discussed and include: Thin metal films, dye films, photographic and electrophotographic media, bubble media, and erasable media.

(BROWN,BR 74) Brown, B.R. "Optical Data Storage Potential of Six Materials." Applied Optics. Vol. 13, No. 4, April 1974, pp. 761-766. 10 refs.

Six materials are subjected to writing sensitivity measurements and tests for resolution limits. The read/write experiments are made using GaAs lasers. Two materials have resolution limits due to grain noise, one to domain stability, and two demonstrate wavelength limited resolution. PtCo appears capable of greater than 10^8 bits/cm^2 (6.45 x 10^8 bits/in^2) at data rates of 50 Mbits/second. Readout signal-to-noise ratios are calculated on theoretical grounds.

(CHAUDHARI,P 73) Chaudhari, P., J.J. Cuomo, and R.J. Gambino. "Amorphous Metallic Films for Magneto-Optic Applications." Applied Physics Letters. Vol. 22, No. 7, April 1, 1973, pp. 337-339. 4 refs.

Compositions of Gd-Co have been found which have compensation points near room temperature. One consequence of this is the possibility of using GdCo films as a write-read-erase storage medium. Magnetooptic properties of these films are reported here and write and erase experiments are performed. Typical laser power density required is 0.5 nJ/um^2 with a 1 nsec pulsewidth to write a spot with a diameter of a few micrometers. Two methods of erasure are achieved; i.e., erasure can be accomplished by using a large bias field at room temperature, or a laser pulse similar to the write pulse can be used in conjunction with a smaller bias field to accomplish erasure. Good signal-to-noise ratios are observed. Write-read-erase cycling can be accomplished many times without degradation of the films.

(CHEN,D 64) Chen, D., and Y. Gondo. "Temperature Dependence of the Magneto-Optic Effect and Resonance Phenomena in Oriented MnBi Films." Journal of Applied Physics. Vol. 35, No. 3, March 1964, pp. 1024-1025. 7 refs.

Observations of the magnetooptic properties of oriented MnBi films are made at temperatures ranging from 80^{o}K to 300^{o}K. The films are polycrystalline thin films with the c axis of the crystallites oriented perpendicular to the plane of the film. As the temperature decreases from 300^{o}K to 84^{o}K, it was found that the Kerr rotation decreases by a factor of 3/2 when the film is in the remanent state and increases by a factor of 10 when the film is in the saturation state. It is also observed that the resistivity decreases by a factor of 2 and the reflected light intensity decreases by a factor of 6. The anisotropy constant estimated from ferromagnetic resonance data decreases from 4.5×10^6 erg/cm^3 (4.5×10^{-1} J/cm^3) at 162°K to zero at 84°K.

(CHEN,D 68B) Chen, D., J.F. Ready, and E. Bernal G. "MnBi Thin Films: Physical Properties and Memory Applications." Journal of Applied Physics. Vol. 39, No. 8, July 1968, pp. 3916-3927. 20 refs.

This paper describes MnBi film preparation; discusses the relationship of absorption coefficients, wavelength, and Faraday rotation; and magnetic properties of the MnBi-mica films. Writing techniques, reading techniques, and reading speed at a good signal-to-noise ratio are thoroughly discussed. Experimental results which are given on the required laser power, writing spot size, signal-to-noise ratios, and readout rates are in general agreement with theoretical analysis.

(CHEN,D 70A) Chen, D., R.L. Aagard, and T.S. Liu. "Magneto-Optic Properties of Quenched Thin Films of MnBi and Optical Memory Experiments." Journal of Applied Physics. Vol. 41, No. 3, March 1, 1970, pp. 1395-1396. 7 refs.

Low temperature phase MnBi thin films are prepared and their physical properties are measured and compared. Optical memory experiments are performed using the high temperature phase quenched film. The results of laser Curie-point writing indicates that high temperature quenched phase MnBi is more desirable as an optical storage medium than the low temperature phase film. The quenched high temperature phase film anneals back to the low temperature phase with an annealing time constant of about 2 years at room temperature and an activation energy of 1.08 eV (1.73×10^{-19} J). Useful life is shorter than predicted by the annealing time constant since the Curie-point writing characteristics are affected by only a small amount of transformation to the normal phase. Further information on the high temperature phase MnBi film characteristics are presented in (CHEN,D 70B) which is not separately annotated.

5.1 MEDIA ANNOTATIONS

(CHEN,D 71) Chen, Di. "Preparation and Stability of MnBi Thin Films." Journal of Applied Physics. Vol. 42, No. 9, August 1971, pp. 3625-3628, 13 refs.

A new vapor deposition method of preparing MnBi thin films is described in this paper. This method deposits the low temperature phase MnBi which is transformable to the high temperature phase by quenching from above 360^{o}C.

(CHEN,D 73) Chen, Di, Gary N. Otto, and Francis M. Schmit. "MnBi Films for Magnetooptic Recording." IEEE Transactions on Magnetics. Vol. MAG-9, No. 2, June 1973, pp. 66-83. 43 refs.

This comprehensive treatment of magnetooptic recording on MnBi films gives an in-depth coverage of film preparation, magnetic properties, optical and magnetooptic properties of manganese bismuth. The mechanism of thermomagnetic writing on these films is described as well as the magnetooptic readout technique. Results of thermomagnetic writing on and magnetooptic reading from an MnBi coated glass disk are discussed. Some attention is also given to holographic memories on MnBi films.

(CHEN,D 74) Chen, D. "Magnetic Materials for Optical Recording." Applied Optics. Vol. 13, No.4, April 1974, pp. 767-778. 40 refs.

This paper presents a review of the present status (circa 1974) of optomagnetic recording technology. A table of eleven recording parameters for 21 magnetooptic memory materials is presented.

(CHEN,FS 68) Chen, F.S., J.T. LaMacchia, and D.B. Fraser. "Holographic Storage in Lithium Niobate." Applied Physics Letters. Vol. 13, No. 7, October 1, 1968, pp. 223-225. 5 refs.

This paper describes experiments using lithium niobate as a holographic storage medium. Complete erasure is possible by heating the crystals to 170^{o}C. Diffraction efficiencies up to 40% and recorded spatial frequencies up to 1600 lines/mm are reported. A related paper (CHEN,FS 69) studies in depth the optically induced change of refractive indices responsible for the performance of lithium niobate as a holographic storage medium.

(CHEN,M 81) Chen, M., and V. Marrello. "The Effect of Overcoats on the Ablative Writing Characteristics of Tellurium Films." DiStephano, T.H., ed Proceedings of the Society of Photo-Optical Instrumentation Engineers: Optical Storage Materials; November 18,1980; Ossining, New York. Bellingham, Washington: Society of Photo-Optical Instrumentation Engineers; 1981; Vol. 263: pp. 75-77. 7 refs.

Degradation in the writing sensitivity of Te films is found to occur as a result of recording through surface coatings of silicon dioxide or polymethyl methacrylate. Experiments are made using several thicknesses of overcoats. Measurement results are compared to results of thermal calculations. Effects on the writing sensitivity which are not thermal in nature are also noted.

(CHIDA,K 77) Chida, Kazunori, Bunjiro Tsujiyama, Akinori Katsui, and Kazumichi Egashira. "Magnetooptical Memory Experiments on a Rotating Mn-Cu-Bi Disk Medium." IEEE Transactions on Magnetics. Vol. MAG-13, No. 3, May 1977, pp. 982-988. 18 refs.

Dynamic memory characteristics of a magnetooptic memory medium are investigated. The medium consists of vacuum deposited layers of Bi, Mn, and Cu with an overcoating of SiO. The material is deposited on a 139mm diameter glass disk. Writing on the disk is performed at a 0.5 MHz rate. Reading is accomplished with a raw bit error rate of 5.09×10^{-6} without error correction. Curie-point writing is performed using an Argon ion laser with a wavelength of 5145 Angstrom units (514.5 nm). The same laser with reduced intensity is used for Kerr effect reading from the disk.

(CHOW,KK 68) Chow, Kungta K., William B. Leonard, and R. Lawrence Comstock. "Magnetooptic Studies of Thin GdIG Sections." IEEE Transactions on Magnetics. Vol. MAG-4, No. 3, September 1968, pp. 416-421. 20 refs.

This paper discusses writing and reading techniques, bit density and stability, and coercivity of thin GdIG sections. Of particular note is the achieving of high coercivity--approximately an order of magnitude greater than for bulk materials. This high coercivity is attributed to stress induced in the wafers by the sectioning and polishing operations. Tests are performed that substantiate this belief. Compressional stress applied during the writing of bits improve the stability of the written bits. Areal bit densities of $10^4/in^2$ ($1.55 \times 10^3/cm^2$) are obtained.

(COEURE,P 71) Coeure, Philippe, Jean-Claude Gay, and Jacques Carcey. "Thermomagnetic Properties of Fine-Grain Polycrystalline GdIG." IEEE Transactions on Magnetics. Vol. MAG-7, No. 3, September 1971, pp. 397-401. 18 refs.

Bulk and wafer thermomagnetic properties of $Gd_3Fe_5O_{12}$ and $Gd_{2.5}Tb_{0.5}Fe_5O_{12}$ are measured and the results are reported. Experimental recording and reading is then performed on GdIG. Bit size is a function of the bias field and bias temperature. A writing speed of 10^5 bits/second is obtained. The bit diameter was approximately 15 um. Erasure is possible and write-read-erasure cycles are performed 10^6 times with no noticeable change in read signals.

(COMSTOCK,RL 70A) Comstock, R.L., and P.H. Lissberger. "Magneto-Optic Properties of CrTe Films Prepared by Sequential Evaporation." Journal of Applied Physics. Vol. 41, No. 3, March 1, 1970, pp. 1397-1398. 4 refs.

CrTe films are prepared by sequential evaporation and subjected to tests for the magnetic properties which are relevant to magnetooptic memories. The predicted laser power required for writing at 0.9 um with CrTe is one-third that required with MnBi. With 0.4 A/W photodiode responsivity, 1 mW transmitted laser power and 10 MHz bandwidth, the ultimate S/N of CrTe is predicted to be 53 dB compared with 65 dB for MnBi.

(COMSTOCK,RL 70B) Comstock, R. Lawrence, Eugene B. Moore, and D.A. Nepela. "Magnetic Properties of Tb-Substituted GdIG Films Chemically Deposited on YAG Substrates." IEEE Transactions on Magnetics. Vol. MAG-6, No. 3, September 1970, pp. 558-563. 24 refs.

$GdFe_5O_{12}$ is deposited on yttrium aluminum garnet substrates by spin coating followed by a high temperature (300-500^{o}C) drying procedure. Tb is substituted for Gd ions in the iron garnet and $Tb_{1.4}Gd_{1.6}Fe_5O_{12}$ is written on with an argon laser. The recorded bits are 6 um wide and have sharp bit boundaries.

(CRAIGHEAD,HG 82) Craighead, H.G., R.E. Howard, P.F. Liao, D.M. Tennant, and J.E. Sweeney. "Textured Germanium Optical Storage Medium." Applied Physics Letters. Vol. 40, No. 8, April 15, 1982, pp. 662-664. 6 refs.

Textured germanium films are prepared by thermal evaporation in vacuo onto glass and then subjected to ion etching with a gas mixture of CCl_2F_2, argon, and oxygen. This process results in the generation of tall uniform columns of germanium. This textured surface can be converted into reflective spots by locally melting the columnar structures which subsequently collapse to form a smooth surface. The recording characteristics of this medium exhibit low writing energy requirements, high contrast, and long term stability.

(CREDELLE,TL 72) Credelle, T.L., and F.W. Spong. "Thermoplastic Media for Holographic Recording." RCA Review. Vol. 33, No. 1, March 1972, pp. 206-226. 19 refs.

A sandwich type structure consisting of substrate, conductive coating, photoconductor, and thermoplastic layers is described physically and operationally. The medium is used to store holograms which are readable almost instantaneously. The medium is also bulk erasable and reusable.

(DEKKER,P 74) Dekker, P., P.W. Jedeloo, and S. Middlehoek. "Temperature Dependence of the Coercive Force of MnBi Films." IEEE Transactions on Magnetics. Vol. MAG-10, No. 3, September 1974, pp. 591-594. 13 refs.

This paper reports on an investigation of the variation of coercive force of MnBi films with temperature. Experimental measurement results are in partial agreement with theory; precise comparison is not possible due to other unknown factors.

(DREXLER,J 81) Drexler, J. "Drexon(T.M.) Optical Memory Media for Laser Recording and Archival Data Storage." DiStephano, T.H., ed. Proceedings of the Society of Photo-Optical Instrumemtation Engineers: Optical Storage Materials; November 18, 1980; Ossining, New York. Bellingham, Washington: Society of Photo-Optical Instrumentation Engineers; 1981; Vol. 263: pp. 87-91. 1 ref.

Drexon(TM) is an optical data storage medium composed of particles of silver suspended in a photographic-quality gelatin. Both reflective spherical particles and black filamentary particles of silver are used. Because of the long life properties of silver halide photographic films using these materials, it is expected that Drexon(TM) will also have long life characteristics as an optical data storage medium.

(EDEN,DD 81) Eden, Dayton D. "Vanadium Dioxide Storage Material." Optical Engineering. Vol. 20, No. 3, May-June 1981, pp.377-378. 4 refs.

Vanadium dioxide is tested for its suitability as an optical data storage material. Results of this testing indicate that 0.5 um spot diameters should be achievable with write times of a few nanoseconds. The material is bulk erasable and has survived 10^8 record-erase cycles without degradation. These results are dependent on careful thermal design of the media structure.

(EGASHIRA,K 74) Egashira, K. and T. Yamada. "Kerr-Effect Enhancement and Improvement of Readout Characteristics in MnBi Film Memory." Journal of Applied Physics. Vol. 45, No. 8, August 1974, pp. 3643-3648. 12 refs.

Silicon oxide, SiO, is used to enhance the Kerr effect by coating it on magnetic films. Enhancements of the Kerr effect up to a factor of 2 or more is accomplished when a SiO layer is coated on an MnBi film surface. Measurements compare favorably with calculations.

(EVTIHIEV,NN 76) Evtihiev, N.N., N.A. Economov, A.R. Krebs, N.A. Zamjatina. "Co-Ferrite-New Magnetooptic Recording Material." IEEE Transactions on Magnetics. Vol. MAG-12, No. 6, November 1976, pp. 773-775. 5 refs.

Cobalt-ferrite thin films are grown on MgO substrates. The flux reversal mechanism and magnetooptic parameters of these films are studied over a wide composition range. Performance factors for thermomagnetic recording with Co-ferrites are found to approximate those of MnBi. Co-ferrites have good stability of phase composition in recording and display good thermal stability.

(HARTSTEIN,A 80) Hartstein, A., J.C. Tsang, D.J. DiMaria, and D.W. Dong. "Observation of Amorphous Silicon Regions in Silicon-Rich Silicon Dioxide Films." Applied Physics Letters. Vol. 36, No. 10, May 15, 1980, pp. 836-837. 12 refs.

Chemically vapor-deposited silicon-rich SiO_2 films are measured for their Raman scattering and optical transmission characteristics. There are segregated regions of amorphous silicon in the as-deposited films. Annealing at specific temperatures produce films with both amorphous and crystalline regions. If the films are annealed at 1150°C, complete crystallization occurs.

(HAUDEK,H 71) Haudek, H., and W.K. Unger. "Lattice Constants and Phase Transitions in Oriented MnBi Films." Physica Status Solidi. Vol. (a)7, No. 1, September 16, 1971, pp. 393-400. 13 refs.

MnBi films evaporated onto mica subtrates are studied in thicknesses from 20 to 100 nanometers. Discontinuities are observed in the lattice parameter c during low temperature to high temperature phase transitions. Quenched high temperature phase films transform to a low temperature phase film via a metastable phase at temperatures between 80°C and 220°C. Results on thermomagnetic writing reported previously (CHEN,D 70B) are interpreted and the following conclusion is stated. "...one can conclude that either the spots are heated to above the 'real-Curie-temperature' of the lt phase (approximately 480°C,...) or that writing can be performed in lt phase MnBi films without complete loss of magnetization in the spots during the writing process."

(HERD,SR 82A) Herd, S.R., K.Y. Ahn, R.J. von Gutfeld, and D.R. Vigliotti. "Structural Changes in Se-Te Bilayers by Laser Writing." Journal of Applied Physics. Vol. 53, No. 5, May 1982, pp. 3520-3522. 1 ref.

Bilayer films of selenium on tellurium are prepared as well as films of tellurium and results of melting holes in these films are compared. Some of the films are prepared by sputtering and some by evaporation. Holes are melted using krypton lasers and dye lasers. It is concluded that superior hole formations are obtained in the SeTe films due to amorphous alloy formation which provide both an antireflection condition and corrosion protection.

(HERD,SR 82B) Herd, S.R., K.N. Tu, K.Y. Ahn, T.H. DiStefano, and N.J. Mazzeo. "Laser Writing on Silicon-Metal Bilayers for Optical Storage. II. Microscopic Study." Journal of Applied Physics. Vol. 53, No. 6, June 1982, pp. 4372-4378. 11 refs.

Several materials are investigated for their writing characteristics. This paper is a continuance of a previous paper (HERD,SR 82A). Among the several materials investigated, Rh-Si requires a relatively low writing power and has excellent archival properties.

(JIPSON,VB 81) Jipson, V.B., and C.R. Jones. "Infrared Dyes for Optical Storage." DiStephano, T.H., ed. Proceedings of the Society of Photo-Optical Instrumentation Engineers: Optical Storage Materials; November 18, 1980; Ossining, New York. Bellingham, Washington: Society of Photo-Optical Instrumentation Engineers; 1981; Vol. 263: pp. 105-109. 15 refs.

An infrared absorbing dye, hydroxy squarylium, is subjected to experimentation relative to the use as an optical storage medium. Several structural variations are tried and found to be generally more sensitive than tellurium. The investigators are interested in developing an optical storage material suitable for use with GaAlAs lasers. It is determined that finding organic dyes with suitable optical absorption characteristics is difficult, but that in general their thermal properties are superior to those of metal films. Hydroxy squarylium is found to be stable under repeated readout conditions. It exhibits good thermal stability and has writing characteristics similar to tellurium.

(KIVITS,P 81) Kivits, P., B. Jacobs, and P. Zalm. "Summary Abstract: Research on Materials for Optical Storage." DiStephano, T.H. ed. Proceedings of the Society of Photo-Optical Instrumentation Engineers: Optical Storage Materials; November 18, 1980; Ossining, New York. Bellingham, Washington: Society of Photo-Optical Instrumentation Engineers; 1981; Vol. 263: pp. 68-69. 10 refs.

This is a summary of information on tellurium and tellurium compounds which has been gathered over a period of time. Among the points of interest are that the substrate material has a strong influence on the threshold power which is required to open holes, and that amorphous compounds of tellurium are somewhat less sensitive than pure tellurium films.

(LANGLET,R 73) Langlet, Regis., Bernard Carre, and Jean-Paul Pivot. "High Speed Recording on MnBi Thin Films Deposited on Discs." IEEE Transactions on Magnetics. Vol. MAG-9, No. 3, September 1973, pp. 401-405. 11 refs.

Experiments on a rapidly rotating (24,000 rpm) disk using argon and helium-neon lasers are performed. Thermomagnetic writing on the MnBi disk is employed and reading is accomplished using polar Kerr effects. Disks 9 mm thick and 40 mm in diameter and rotated at high speed allow the use of linear speeds from 1 m/sec to 40 m/sec. A variety of pulse widths are used with a maximum pulse repetition frequency of 33 MHz. Writing of 1 to 5 um spots is done with an argon laser at 488 nm and reading is accomplished with a helium-neon laser. The read scheme employs an electrooptical phase modulator in order to achieve modulated detection which is claimed to be relatively insensitive to various noise sources. It is shown that increased writing power is required to reduce problems with the dynamic stability of the disk. It is also found that for short pulse widths, the speed of the rotating disk produces bit displacement and also requires increased writing power. This bit displacement requires compensation during the readout process.

(LAW,KY 80) Law, K.Y., P.S. Vincett, R.O. Loutfy, L. Alexandru, M.A. Hopper, J.H. Sharp, and G.E. Johnson. "Ablative Optical Recording Using Organic Dye-In-Polymer Films." Applied Physics Letters. Vol. 36, No. 11, June 1, 1980, pp. 884-885. 9 refs.

The results of investigations relative to using dissolved dyes in polymer films as an optical storage medium are discussed. The investigations are made with a laser wavelength of 457 nm recording marks as small as 0.5 um using a 0.95 NA objective lens. The dye used in these experiments is polyester yellow dissolved in poly(vinyl acetate) spin coated on a reflecting layer. A glass substrate is used and tests are made with and without an overcoating. When compared with a 15 nm monolayer of Te, the dye-in-polymer medium is found to be the more sensitive. A 100 hour test at 50^{o}C is performed which indicates little, if any, degradation.

(LEE,K 73B) Lee, Kenneth. "Magnetic Thin Films for Optical Storage." Journal of Vacuum Science and Technology. Vol. 10, No. 5, September/October 1973, pp. 631-639. 65 refs.

Material requirements for thermal magnetic recording are discussed in this paper. Many materials are compared for these requirements and four materials are found to exhibit the necessary properties for an optical storage medium. The four materials having the desired properties are MnBi doped with Ti or Ni, MnAlGe, MnGaGe, and amorphous $GdCo_5$.

(LEWICKI,GW 69) Lewicki, G.W. "Curie-Point Switching in Mn-Bi Films." IEEE Transactions on Magnetics. Vol. MAG-5, No. 3, September 1969, pp. 298-299. 2 refs.

Helium-neon laser experiments with Curie-point switching in MnBi films are described in this paper. It is concluded that magnetization structure smaller than the wavelength of light can be written in with Curie-point switching and that the average magnetization can be switched to any value between +Is and -Is by varying the applied magnetic field over a range of a few hundred oersteds (7.96×10^1 A/m) while writing 1 um spots on MnBi films.

(LEWICKI,GW 70) Lewicki, G., and J.E. Guisinger. "Narrow Curie-Point Switching Transfer Characteristics in Mn-Bi Films." Applied Physics Letters. Vol. 16, No. 6, March 15, 1970, pp. 240-242. 5 refs.

MnBi films have a wide range of magnetic field from 300 Oe (2.39×10^4 A/m) to 500 Oe (3.98×10^4 A/m) which controls switching (LEWICKI,GW 69). This paper reports on investigations which show that the range of magnetic fields which control Curie-point switching varies with the relative concentration of manganese to bismuth and reaches a minimum when the Mn-to-Bi weight ratio is approximately 0.49. Films are prepared which had a range of controlling field as small as 18 Oe (1.4×10^3 A/m).

(MIMURA,Y 76) Mimura, Y., N. Imamura, and T. Kobayashi. "Magnetic Properties and Curie Point Writing in Amorphous Metallic Films." IEEE Transactions on Magnetics. Vol. MAG-12, No. 6, November, 1976, pp. 779-781. 8 refs.

Curie point writing in amorphous films of Tb-Fe and Dy-Fe is described in this paper. The magnetic reversal profile inside the bits is explained by the self demagnetizing field originating within the reversed region itself. Bits are written with a He-Ne laser beam modulated electrooptically. Reading is accomplished visually by using a polarizing microscope.

(RANCOURT,JD 81) Rancourt, James D. "Design and Production of Tellurium Optical Data Disks." Beiser, Leo, ed. Proceedings of the Society of Photo-Optical Instrumentation Engineers: Advances in Laser Scanning Technology; August 27-28, 1981; San Diego, California. Bellingham Washington: Society of Photo-Optical Instrumentation Engineers; 1981; Vol. 299: pp. 57-63. 5 refs.

A "first order merit function" is defined for tellurium based optical data disks. The relative efficiencies of monolayer and trilayer structures are discussed. The discussion states that using a trilayer structure can result in as much as a 20-fold improvement over the monolayer structure. Preparation of substrates prior to coating is reviewed. The lack of suitable RBER (raw bit error rate) measuring equipment and the lack of specifications regarding storage, usage, and test conditions for optical data disks is mentioned.

(SMITH,AW 73) Smith, A. W. "Optical Storage in VO_2 Films." Applied Physics Letters. Vol. 23, No. 8, October 15, 1973, pp. 437-438. 9 refs.

At near infrared wavelengths, a semiconductor-to-metal transition in vanadium dioxide, VO_2 can be utilized for storing digital information. Experiments are conducted on rf sputtered polycrystalline films using double-heterostructure GaAs injection lasers whose output is varied with neutral-density attenuators. Grain in the films limit the spot spacing to about 2 micrometers. Another storage medium, Te-As-Ge chalcogenide glass utilizing a crystalline-to-amorphous transition, is compared to the VO_2 and found to be somewhat less sensitive. Both media are considered to have good writing rates and large read signals without the necessity of polarized light.

(SMITH,TW 81) Smith, T. W. "The Role of Polymers in Optical Recording Media." DiStephano, T. H. ed. Proceedings of the Society of Photo-Optical Instrumentation Engineers: Optical Storage Materials; November 18, 1980; Ossining, New York. Bellingham, Washington: Society of Photo-Optical Instrumentation Engineers; 1981; Vol. 263: pp. 100-105. 33 refs.

This paper reviews and summarizes the use of polymer materials in optical storage media. Discussions are presented for the use of polymers in substrates, imaging layers, dielectric spacers, and protective overcoatings. Dye/polymer and metal (pigment)/polymer composites are also discussed.

(STRAND,D 80) Strand, David. "Optical Recording with Amorphous Materials." Optical Engineering. Vol. 20, No. 3, May-June 1981, pp. 379-381. 16 refs.

This paper is a non-mathematical discussion of the property changes which occur in amorphous materials when they are exposed to light. Although several property changes are possible, the major emphasis is placed on changes between the amorphous and crystalline states. In some materials, the changes can be reversible. The general conclusion states that "ovonic chalcogenide films can be used to produce ideal optical recording media."

(SUNAGO,K 76) Sunago, K., S. Matsushita, and Y. Sakurai. "Thermomagnetic Writing in Tb-Fe Films." IEEE Transactions on Magnetics. Vol. MAG-12, No. 6, November 1976, pp. 776-778. 12 refs.

Curie-point (thermomagnetic) writing experiments are performed on films of Tb-Fe deposited on glass substrates. These films do not exhibit grain noise since they are amorphous. Good signal-to-noise ratios can be obtained because of this property. Experiments are made with both thermally evaporated films and rf-sputtered films. Spots written with a He-Ne laser are clear, circular, and can be produced with low power lasers. A significant feature of Tb-Fe films is that they have low Curie temperatures and high coercive forces which permit the use of low power lasers for writing spots.

(TERAO,M 79) Terao, M., K. Shigematsu, M. Ojima, S. Horigome, Y. Taniguchi, and S. Yonezawa. "New Recording Thin Film for Optical Video Disk." Digest of Technical Papers: 1979 IEEE/OSA Conference on Laser Engineering and Applications; May 30-June 1, 1979; Washington, D.C. New York: Institute of Electrical and Electronic Engineers; 1979; pp. 103-104. 4 refs.

This digest reports on the use of As-Te-Se amorphous chalcogenide films for direct-read-after-write optical video-disk applications. Arsenic used in conjunction with tellurium results in clean holes and selenium is added which greatly increases film stability. About 10 mW of incident laser-beam power is required to write on films deposited on PMMA. Frequency modulated NTSC video signals are recorded on As-Te-Se films and when read by reflected light, a signal-to-noise ratio of about 45 dB is obtained.

(TOGAMI,Y 78) Togami, Yuji. "Stability of Small Bits Written in Amorphous GdCo Thin Films." Applied Physics Letters. Vol. 32, No. 10, May 15, 1978, pp. 673-675. 3 refs.

This paper reports the results of experiments dealing with the stability of small bits written on four GdCo amorphous thin films. Two films are homogeneous and two are inhomogeneous along the film thickness. It is concluded that bits written on the inhomogeneous films are stable and those written on homogeneous films are unstable.

(TOGAMI,Y 82) Togami, Y., K. Kobayashi, M. Kajiura, K. Sato, and T. Teranishi. "Amorphous, GdCo Disk for Thermomagnetic Recording." Journal of Applied Physics. Vol. 53. No. 3, March 1982, pp. 2335-2337. 7 refs.

Disks of amorphous GdCo are prepared by rf-sputtering onto a glass substrate and subjected to thermogmagnetic writing and magnetooptic readout experiments. The GdCo films are deposited in two layers as a result of findings from previous experiments (TOGAMI,Y 78). A signal-to-noise ratio of 32 dB (100 kHz bandwidth) is obtained. The writing rate is 1 MHz with an incident laser power of 5.6 mW. Readout laser power is approximately 2 mW.

(VONGUTFELD,RJ 72) von Gutfeld, R. J., and P. Chaudhari. "Laser Writing and Erasing on Chalcogenide Films." Journal of Applied Physics. Vol. 43, No. 11, November 1972, pp. 4688-4692. 17 refs.

Reverse mode (RM) recording and erasure methods are studied for amorphous films composed of Te, Ge, and As. Films were prepared by both sputtering and evaporation techniques on a variety of substrates. The amorphous films are crystallized by heating to approximately 90^{o}C as a preparation for the RM recording. RM recording consists of switching the crystalline material locally to the amorphous state as opposed to the conventional procedure of switching from the amorphous to the crystalline state. It is found possible to erase in any one of three ways. RM recording is a fast-write, slow-erase process in chalcogenide media. Limited write-read-erase cycles are found to cause no significant damage to the films although this is not studied extensively.

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