

## Evolution of the optical, magnetic and morphological properties of PVA films filled with CuSO<sub>4</sub>

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### Abstract:

Polyvinylalcohol (PVA) films filled with different concentrations of CuSO<sub>4</sub> were prepared by casting method. The optical, magnetic and morphological properties of these films were intensively investigated in this study. The optical absorption spectra were performed. The assignment of the main absorption peaks was done. The optical parameters such as the absorption coefficient, the electronic band structure, the band tail and the energy gap were estimated. The characteristic features of the electron paramagnetic resonance (EPR) spectra were discussed. The dependence of the g values, the hyperfine coupling constant, the peak to peak linewidth, the number of paramagnetic centres and the asymmetry ratio on filling were studied. The morphology of the polymeric films demonstrated structural modifications with filling. A correlation between the optical, magnetic and morphological properties was accomplished. Three types of Cu<sup>2+</sup> were depicted in this study and were accompanied by three regions of filling, low and high FLs as well as an intermediate one, of interesting physical properties. The studied samples revealed significant changes of the physical properties with filling. This indicated the high sensitivity of these samples to filling and suggested their applicability in magnetic and optical devices. (C) 2010 Elsevier B.V. All rights reserved.

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### References

1. Title: Electron spin resonance and optical studies of poly(methylmethacrylate) doped with CuCl<sub>2</sub>

Author(s): Abdelaziz, M.

Source: JOURNAL OF APPLIED POLYMER SCIENCE Volume: 108 Issue: 2 Pages: 1013-1020 DOI: 10.1002/app.27320 Published: APR 15 2008

2. Title: Effect of dopant mixture on structural, optical and electron spin resonance properties of polyvinyl alcohol

Author(s): Abdelaziz, M.; Abdelrazek, E. M.

Source: PHYSICA B-CONDENSED MATTER Volume: 390 Issue: 1-2 Pages: 1-9 DOI: 10.1016/j.physb.2006.07.067 Published: MAR 1 2007

3. Title: Effect of the molecular weights on the optical and mechanical properties of poly(vinyl alcohol) films

Author(s): Abd El-Kader, K.A.M.; Abdel Hamied, S.F.; Mansour, A.B.; et al.

Source: Polymer Testing Volume: 21 Issue: 7 Pages: 847-50 DOI: 10.1016/S0142-9418(02)00020-X Abstract Number: A2002-20-7865T-003 Published: 2002

4. Title: Electrical and optical properties of newly synthesized glyoxime complexes

Author(s): Aydogdu, Y; Yakuphanoglu, F; Aydogdu, A; et al.

Source: SOLID STATE SCIENCES Volume: 4 Issue: 6 Pages: 879-883 Article Number: PII S1293-2558(02)01298-0 DOI: 10.1016/S1293-2558(02)01298-0 Abstract Number: A2002-20-7220F-002 Published: JUN 2002

5. Title: [not available]

Author(s): Banwell, C. N.

Source: Fundamental of Molecular Spectroscopy Published: 1983  
Publisher: MCGRAW-HILL Book Company (U.K.) Limited, London

6. Title: [not available]

Author(s): BERNSTEIN PA

Source: CONCURRENCY CONTROL Pages: 271 Published: 1987

7. Title: Optical and optoelectronic properties of ZnS nanostructured thin film

Author(s): Borah, J. P.; Sarma, K. C.

Source: ACTA PHYSICA POLONICA A Volume: 114 Issue: 4 Pages: 713-719 Published: OCT 2008

8. Title: COMPARATIVE THEORETICAL-STUDY OF THE DOPING OF CONJUGATED POLYMERS - POLARONS IN POLYACETYLENE AND POLYPARAPHENYLENE

Author(s): BREDAS, JL; CHANCE, RR; SILBEY, R

Source: PHYSICAL REVIEW B Volume: 26 Issue: 10 Pages: 5843-5854 DOI: 10.1103/PhysRevB.26.5843 Published: 1982

9. Title: Optical and electronic properties of metal doped polymers for integrated optics

Author(s): Bulinski, M; Kuncser, V; Cristea, D; et al.

Conference: International Conference on Advanced Materials and Structures Location: TIMISOARA, ROMANIA Date: SEP 19-20, 2002

Sponsor(s): Swiss Natl Sci Fdn; Zappas Ind

Source: JOURNAL OF OPTOELECTRONICS AND ADVANCED MATERIALS Volume: 5 Issue: 1 Pages: 331-335 Published: MAR 2003

10. Title: [not available]

Author(s): CARRINGTON A

Source: INTRO MAGNETIC RESON Published: 1980

11. Title: IONIC-CONDUCTIVITY AND GLASS-TRANSITION OF BOROPHOSPHATE GLASSES

Author(s): CHIODELLI, G; MAGISTRIS, A; VILLA, M

Source: SOLID STATE IONICS Volume: 18-9 Pages: 356-361 DOI: 10.1016/0167-2738(86)90140-2 Part: Part 1 Abstract Number: A1986-070599 Published: JAN 1986

12. Title: CONDUCTION IN NON-CRYSTALLINE SYSTEMS .5. CONDUCTIVITY, OPTICAL ABSORPTION AND PHOTOCONDUCTIVITY IN AMORPHOUS

SEMICONDUCTORS Author(s): DAVIS, EA; MOTT, NF

Source: PHILOSOPHICAL MAGAZINE Volume: 22 Issue: 179 Pages: 903-& DOI: 10.1080/14786437008221061 Abstract Number: A1971-002430; B1971-001369 Published: 1970

13. Title: TOWARD A UNIFIED THEORY OF URBACHS RULE AND EXPONENTIAL ABSORPTION EDGES

Author(s): DOW, JD; REDFIELD, D

Source: PHYSICAL REVIEW B Volume: 5 Issue: 2 Pages: 594-& DOI: 10.1103/PhysRevB.5.594 Abstract Number: A1972-020011 Published: 1972

14. Title: [not available]

Author(s): EIKHODARY A

Source: PHYSICA B Volume: 404 Pages: 1287 Published: 2009

15. Title: EVOLUTION OF THE MAGNETIC-PROPERTIES DURING THE ELECTROCHEMICAL DOPING AND UNDOPING OF POLYACETYLENE (CH)<sub>x</sub> WITH LITHIUM

Author(s): ELKHODARY, A; BERNIER, P

Source: JOURNAL OF CHEMICAL PHYSICS Volume: 85 Issue: 4 Pages: 2243-2248

DOI: 10.1063/1.451120 Abstract Number: A1986-118492 Published: AUG 15 1986

16. Title: [not available]

Author(s): FAHMY T

Source: INT J POLYM MATER Volume: 50 Pages: 109 DOI:

10.1080/00914030108035094 Published: 2001

17. Title: ELECTRICAL CONDUCTIVITY IN POLY(VINYL CHLORIDE)

Author(s): FLEMING, RJ; RANICAR, JH

Source: JOURNAL OF MACROMOLECULAR SCIENCE-CHEMISTRY Volume: A 4

Issue: 5 Pages: 1223-& DOI: 10.1080/00222337008061015 Published: 1970

18. Title: Application of electron paramagnetic resonance to the study of Cu<sup>2+</sup> ions in Cu-Na ion-exchanged glasses

Author(s): Gonella, F; Caccavale, F; Bogomolova, LD; et al.

Source: APPLIED PHYSICS A-MATERIALS SCIENCE & PROCESSING Volume: 68

Issue: 5 Pages: 539-546 DOI: 10.1007/s003390050937 Abstract Number: A1999-15-7630F-001 Published: MAY 1999

19. Title: [not available]

Author(s): KUIVALAINNEN P

Source: PHYS REV B Volume: 32 Pages: 7900 Published: 1985

20. Title: Spectroscopic investigations of Mn<sup>2+</sup> ions doped polyvinylalcohol films

Author(s): Kumar, GNH; Rao, JL; Gopal, NO; et al.

Source: POLYMER Volume: 45 Issue: 16 Pages: 5407-5415 DOI:

10.1016/j.polymer.2004.05.068 Published: JUL 22 2004

21. Title: Photoinduced changes in photorefractive PVA films doped with Cr<sup>3+</sup> and VO<sup>2+</sup>: EPR and PAS investigations

Author(s): Kumar, M; Dhobale, AR; Kadam, RM; et al.

Source: PRAMANA-JOURNAL OF PHYSICS Volume: 52 Issue: 6 Pages: 647-655 DOI:

10.1007/BF02829870 Abstract Number: A1999-21-7630F-006 Published: JUN 1999

22. Title: [not available]

Author(s): Lu, Y.

Source: Solitons and Polarons in Conducting Polymers Published: 1988

Publisher: World Scientific, Singapore

23. Title: [not available]

Author(s): MYERS RJ

Source: MOL MAGNETISM MAGNET Published: 1973

24. Title: [not available]

Author(s): Nicholls, D.

Source: Complexes and First-Row Transition Elements Published: 1974

Publisher: Macmillan Press, London

25. Title: EPR, optical, infrared and Raman studies of VO<sub>2</sub><sup>+</sup> ions in polyvinylalcohol films

Author(s): Omkaram, I.; Chakradhar, R. P. Sreekanth; Rao, J. Lakshmana

Source: PHYSICA B-CONDENSED MATTER Volume: 388 Issue: 1-2 Pages: 318-325

DOI: 10.1016/j.physb.2006.06.134 Published: JAN 15 2007

26. Title: [not available]

Author(s): Pake, G. E.; Estle, T. L.

Source: The Physical Principles of Electron Paramagnetic Resonance Published: 1973

Publisher: W. A. Benjamin, Reading, MA, USA

27. Title: [not available]

Author(s): Pritchard, J.G.

Source: Poly (Vinyl Alcohol): Basic Properties and Uses Published: 1970

Publisher: Gordon & Breach, London

28. Title: Electron paramagnetic resonance and optical absorption studies of Cu<sup>2+</sup> ion doped polyvinyl alcohol films

Author(s): Raju, Ch. Linga; Rao, J. L.; Gopal, N. O.; et al.

Source: MATERIALS CHEMISTRY AND PHYSICS Volume: 101 Issue: 2-3 Pages: 423-427 DOI: 10.1016/j.matchemphys.2006.08.001 Published: FEB 15 2007

29. Title: Electron paramagnetic resonance and optical absorption spectra of Fe(III) ions in alkali zinc borosulphate

Author(s): Rao, JL; Murali, A; Rao, ED

Source: JOURNAL OF NON-CRYSTALLINE SOLIDS Volume: 202 Issue: 3 Pages: 215-221 Abstract Number: A1996-22-7630F-004 Published: JUL 1996

30. Title: ELECTRON-SPIN RESONANCE STUDIES OF MANGANESE(II) AND COPPER(II) SALTS OF POLY(ETHYLENE-CO-METHACRYLIC ACID)S  
Author(s): TAKEI, M; TSUJITA, Y; SHIMADA, S; et al.  
Source: JOURNAL OF POLYMER SCIENCE PART B-POLYMER PHYSICS Volume: 26  
Issue: 5 Pages: 997-1008 DOI: 10.1002/polb.1988.090260505 Abstract Number: A1988-092605 Published: MAY 1988
31. Title: A study of the physical properties of FeCl<sub>3</sub> filled PVA  
Author(s): Tawansi, A; El-Khodary, A; Abdenaby, MM  
Source: CURRENT APPLIED PHYSICS Volume: 5 Issue: 6 Pages: 572-578 DOI:  
10.1016/j.cap.2004.06.026 Published: SEP 2005
32. Title: Structural, electrical and magnetic properties of polystyrene films filled with AgNO<sub>3</sub>-FeCl<sub>3</sub> mixed fillers  
Author(s): Tawansi, A; El-Khodary, A; Youssef, AE  
Source: JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS Volume: 283  
Issue: 2-3 Pages: 199-209 DOI: 10.1016/j.jmmm.2004.05.021 Published: DEC 2004
33. Title: Short-range-order spin clusters in one-dimensional Ising-like antiferromagnetic CoBr<sub>2</sub>-filled PVA films: a study of physical properties  
Author(s): Tawansi, A; Zidan, HM; Oraby, AH; et al.  
: JOURNAL OF PHYSICS D-APPLIED PHYSICS Volume: 31 Issue: 24 Pages: 3428-3436  
DOI: 10.1088/0022-3727/31/24/005 Abstract Number: A1999-08-7570-007 Published: DEC 21 1998
34. Title: ELECTRON-SPIN RESONANCE STUDIES OF IONIC INTERACTIONS IN SULFONATED POLYSTYRENE IONOMERS - MANGANESE(II) SALTS  
Author(s): TORIUMI, H; WEISS, RA; FRANK, HA  
Source: MACROMOLECULES Volume: 17 Issue: 10 Pages: 2104-2107 DOI:  
10.1021/ma00140a039 Published: 1984
35. Title: THE LONG-WAVELENGTH EDGE OF PHOTOGRAPHIC SENSITIVITY AND OF THE ELECTRONIC ABSORPTION OF SOLIDS  
Author(s): URBACH, F  
Source: PHYSICAL REVIEW Volume: 92 Issue: 5 Pages: 1324-1324 DOI:  
10.1103/PhysRev.92.1324 Abstract Number: A1954-02996 Published: 1953
36. Title: Electron spin resonance and ultraviolet spectral analysis of UV-irradiated PVA films filled with MnCl<sub>2</sub> and CrF<sub>3</sub>  
Author(s): Zidan, HM  
Source: JOURNAL OF APPLIED POLYMER SCIENCE Volume: 88 Issue: 1 Pages: 104-111 DOI: 10.1002/app.11569 Abstract Number: A2003-15-6180B-001 Published: APR 4 2003

## Optical Parameters and Absorption Studies of UV-Irradiated Azo Dye-Doped PMMA Films

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### Abstract:

PMMA and PMMA films doped with different contents of azo dye have been made by using the casting technique. The absorption spectral analysis showed that the doped films have two absorption bands attributed to the  $\pi$ - $\pi^*$  and  $\pi$ - $\pi^*$  transition of chromophore groups. These bands disappear upon UV-irradiation, suggesting that the studied system undergoes a photo degradation process. The absorption coefficient and optical energy gap ( $E_g$ ) have been obtained from the absorption edge in the 200-900 nm range. It was found that  $E_g$  decreases with increasing doping levels, whereas it increases with increasing irradiation time. The width of the tail of localized states in the band gap ( $\Delta E$ ) was evaluated using the Urbach edge method. Some optical parameters were determined from the reflection and transmission spectra in the spectral range of 200-2500 nm. The dependence of the refractive index on irradiation time and doping level have been discussed. It was found that the photo-induced refractive index changes are very large. These changes suggest the applicability of the studied system in optical devices. (C) 2010 Wiley Periodicals, Inc. J Appl Polym Sci 117: 1416-1423, 2010

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ISSN: 0021-8995

### References

1. Title: Mechanism of the photoinduced refractive index increase in polymethyl methacrylate.

Author(s): Bowden, M J; Chandross, E A; Kaminow, I P

Source: Applied optics Volume: 13 Issue: 1 Pages: 112-7 DOI: 10.1364/AO.13.000112

Abstract Number: A1974-031065; B1974-019339 Published: 1974-Jan-1

2. Title: TOWARD A UNIFIED THEORY OF URBACHS RULE AND EXPONENTIAL ABSORPTION EDGES

Author(s): DOW, JD; REDFIELD, D

Source: PHYSICAL REVIEW B Volume: 5 Issue: 2 Pages: 594-& DOI:

10.1103/PhysRevB.5.594 Abstract Number: A1972-020011 Published: 1972

3. Title: [not available]

Author(s): DYERJOHN R

Source: APPL ABSORPTION SPEC Published: 1994

4. Title: [not available]

Author(s): KARDINAH T

Source: APPL PHYS LETT Volume: 67 Pages: 795 Published: 1995

5. Title: Large photoinduced refractive index change of polymer films containing and bearing norbornadiene groups and its application to submicron-scale refractive-index patterning

Author(s): Kato, Y; Muta, H; Takahashi, S; et al.

Source: POLYMER JOURNAL Volume: 33 Issue: 11 Pages: 868-873 Published: 2001

6. Title: Large photoinduced refractive index changes of a polymer containing photochromic norbornadiene groups

Author(s): Kinoshita, K; Horie, K; Morino, S; et al.

Source: APPLIED PHYSICS LETTERS Volume: 70 Issue: 22 Pages: 2940-2942 DOI:

10.1063/1.118750 Abstract Number: A1997-14-4270-004; B1997-07-4110-016 Published: JUN 2 1997



7. Title: PHOTOINDUCED NONLINEAR-OPTICAL PHENOMENA IN PBO-BIO1.5-GAO1.5 GLASS

Author(s): KITYK, IV; GOLIS, E; FILIPECKI, J; et al.

Source: JOURNAL OF MATERIALS SCIENCE LETTERS Volume: 14 Issue: 18 Pages: 1292-1293 DOI: 10.1007/BF01262271 Abstract Number: A1995-22-7820D-007; B1995-12-4340-004 Published: SEP 15 1995

8. Title: ON OPTICAL PROPERTIES OF SOME LAYER COMPOUNDS

Author(s): LEE, PA; SAID, G; DAVIS, R; et al.

Source: JOURNAL OF PHYSICS AND CHEMISTRY OF SOLIDS Volume: 30 Issue: 12 Pages: 2719-& DOI: 10.1016/0022-3697(69)90045-6 Abstract Number: A1970-018599 Published: 1969

9. Title: [not available]

Author(s): MANIVANNAN G

Source: TRENDS POLYM SCI Volume: 2 Pages: 282 Published: 1994

10. Title: Influence of UV-irradiation on the structure and optical properties of polycarbonate films

Author(s): Migahed, MD; Zidan, HM

Source: CURRENT APPLIED PHYSICS Volume: 6 Issue: 1 Pages: 91-96 DOI: 10.1016/j.cap.2004.12.009 Published: JAN 2006

11. Title: Optical and electrical properties of some electron and proton irradiated polymers

Author(s): Mishra, R; Tripathy, SP; Sinha, D; et al.

Source: NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION B-BEAM INTERACTIONS WITH MATERIALS AND ATOMS Volume: 168 Issue: 1 Pages: 59-64 DOI: 10.1016/S0168-583X(99)00829-0 Abstract Number: A2000-15-7215N-001 Published: MAY 2000

12. Title: [not available]

Author(s): Mott, N. F.

Source: Philos. Mag. Volume: 24 Pages: 1 Published: 1970

13. Title: Refractive index changes of doped polymer films induced by the photoelimination of meso-ionic heterocyclic compounds with and without a sulfur atom

Author(s): Murase, S; Ban, M; Horie, K

Source: JAPANESE JOURNAL OF APPLIED PHYSICS PART 1-REGULAR PAPERS SHORT NOTES & REVIEW PAPERS Volume: 38 Issue: 12A Pages: 6772-6776 DOI: 10.1143/JJAP.38.6772 Abstract Number: A2000-04-7820D-001 Published: DEC 1999

14. Title: Large photoinduced refractive index changes of transparent polymer films containing photoeliminable diazo and azido groups

Author(s): Murase, S; Horie, K

Source: MACROMOLECULES Volume: 32 Issue: 4 Pages: 1103-1110 DOI:  
10.1021/ma9815511 Published: FEB 23 1999

15. Title: Large photoinduced refractive index increase in polymer films containing phenylazide maintaining their transparency and thermal stability

Author(s): Murase, S; Shibata, K; Furukawa, H; et al.

Source: POLYMER JOURNAL Volume: 35 Issue: 2 Pages: 203-207 DOI:  
10.1295/polymj.35.203 Published: 2003

16. Title: URBACH TAIL IN AMORPHOUS GALLIUM-ARSENIDE FILMS

Author(s): MURRI, R; SCHIAVULLI, L; PINTO, N; et al.

Source: JOURNAL OF NON-CRYSTALLINE SOLIDS Volume: 139 Issue: 1 Pages: 60-66  
DOI: 10.1016/S0022-3093(05)80805-1 Abstract Number: A1992-07-6855-039 Published:  
JAN 1992

17. Title: NEW AZO-DYE-DOPED POLYMER SYSTEMS AS DYNAMIC HOLOGRAPHIC RECORDING MEDIA

Author(s): PHAM, VP; MANIVANNAN, G; LESSARD, RA; et al.

Source: APPLIED PHYSICS A-MATERIALS SCIENCE & PROCESSING Volume: 60 Issue:  
3 Pages: 239-242 DOI: 10.1007/BF01538397 Abstract Number: A1995-10-4240-001;  
B1995-06-4350-001 Published: MAR 1995

18. Title: REAL-TIME DYNAMIC POLARIZATION HOLOGRAPHIC RECORDING ON AUTO-ERASABLE AZO-DYE DOPED PMMA STORAGE MEDIA

Author(s): PHAM, VP; MANIVANNAN, G; LESSARD, RA; et al.

Source: OPTICAL MATERIALS Volume: 4 Issue: 4 Pages: 467-475 Published: MAR 1995

19. Title: REAL-TIME DYNAMIC HOLOGRAPHY USING AZO-DYE DOPED PMMA BASED RECORDING MEDIA

Author(s): PHAM, VP; MANIVANNAN, G; LESSARD, RA

Book Editor(s): Trout, TJ

Conference: Conference on Holographic Materials Location: SAN JOSE, CA Date: FEB 08,  
1995

Sponsor(s): SOC PHOTO OPT INSTRUMENTAT ENGINEERS

Source: HOLOGRAPHIC MATERIALS Book Series: PROCEEDINGS OF THE SOCIETY OF  
PHOTO-OPTICAL INSTRUMENTATION ENGINEERS (SPIE) Volume: 2405 Pages: 133-  
142 DOI: 10.1117/12.205355 Abstract Number: A1996-03-4240-017; B1996-02-4350-034;  
C1996-02-5320K-014 Published: 1995

20. Title: Holographic characterization of azo-dye doped poly(methyl methacrylate) films

Author(s): Pham, VP; Gurusamy, M; Lessard, RA

Conference: 22nd International Conference on Metallurgical Coatings and Thin Films (ICMCTF)

1995) Location: SAN DIEGO, CA Date: APR 24-29, 1995  
Sponsor(s): Amer Vacuum Soc, Vacuum Met & Thin Films Div  
Source: THIN SOLID FILMS Volume: 270 Issue: 1-2 Pages: 295-299 DOI: 10.1016/0040-6090(95)06753-1 Abstract Number: A1996-06-4270-002 Published: DEC 1 1995

21. Title: [not available]  
Author(s): Reiser, A.  
Source: Photoreactive Polymers: The Science and Technology of Resist Published: 1989  
Publisher: John Wiley & Sons, New York, NY, USA

22. Title: [not available]  
Author(s): SADLEJ N  
Source: OPT LASER TECHNOL Volume: 7 Pages: 175 Published: 1974

23. Title: [not available]  
Author(s): SADLEJ N  
Source: OPT LASER TECHNOL Volume: 5 Pages: 230 DOI: 10.1016/0030-3992(73)90012-1 Published: 1973

24. Title: Modification of optical response of polyvinyl acetate induced by 250keV D<sup>+</sup> ion bombardment  
Author(s): Srivastava, AK; Virk, HS  
Source: JOURNAL OF POLYMER MATERIALS Volume: 17 Issue: 3 Pages: 325-328  
Abstract Number: A2001-07-7840-006 Published: SEP 2000

25. Title: Holographic recording by dye-sensitized photopolymerization of acrylamide.  
Author(s): Sugawara, S; Murase, K; Kitayama, T  
Source: Applied optics Volume: 14 Issue: 2 Pages: 378-82 DOI: 10.1364/AO.14.000378  
Abstract Number: A1975-035294; B1975-020385 Published: 1975-Feb-1

26. Title: PHOTOOPTICAL SWITCHING OF POLYMER FILM WAVE-GUIDE CONTAINING PHOTOCHROMIC DIARYLETHENES  
Author(s): TANIO, N; IRIE, M  
Source: JAPANESE JOURNAL OF APPLIED PHYSICS PART 1-REGULAR PAPERS SHORT NOTES & REVIEW PAPERS Volume: 33 Issue: 3A Pages: 1550-1553 DOI: 10.1143/JJAP.33.1550 Abstract Number: A1994-15-4265P-004; B1994-08-4130-008  
Published: MAR 1994

27. Title: [not available]  
Author(s): Tomlinson, W. J.; Chandross, E. A.  
Source: Adv. Photochem. Volume: 12 Pages: 201 Published: 1980

28. Title: THE LONG-WAVELENGTH EDGE OF PHOTOGRAPHIC SENSITIVITY AND OF

## THE ELECTRONIC ABSORPTION OF SOLIDS

Author(s): URBACH, F

Source: PHYSICAL REVIEW Volume: 92 Issue: 5 Pages: 1324-1324 DOI:  
10.1103/PhysRev.92.1324 Abstract Number: A1954-02996 Published: 1953

29.Title: Photoinduced effects in the Sb<sub>2</sub>Se<sub>3</sub>-BaCl<sub>2</sub>-PbCl<sub>2</sub> glasses

Author(s): Wasylak, J; Kucharski, J; Kityk, IV; et al.

Source: JOURNAL OF APPLIED PHYSICS Volume: 85 Issue: 1 Pages: 425-431 DOI:  
10.1063/1.369402 Abstract Number: A1999-03-4270C-002 Published: JAN 1 1999

30.Title: BEHAVIOR OF ELECTRONIC DIELECTRIC CONSTANT IN COVALENT AND IONIC MATERIALS

Author(s): WEMPLE, SH; DIDOMENI, M

Source: PHYSICAL REVIEW B Volume: 3 Issue: 4 Pages: 1338-& DOI:  
10.1103/PhysRevB.3.1338 Abstract Number: A1971-028429 Published: 1971

31.Title: OPTICAL DISPERSION AND STRUCTURE OF SOLIDS

Author(s): WEMPLE, SH; DIDOMENI, M

Source: PHYSICAL REVIEW LETTERS Volume: 23 Issue: 20 Pages: 1156-& DOI:  
10.1103/PhysRevLett.23.1156 Abstract Number: A1970-015431 Published: 1969

32.Title: [not available]

Author(s): Wolaton, A.K.; Moss, T.S.

Source: Proc. R Soc. Volume: 81 Pages: 5091 Published: 1963

33.Title: RECENT DEVELOPMENTS IN AROMATIC AZO POLYMERS RESEARCH

Author(s): XIE, S; NATANSOHN, A; ROCHON, P

Source: CHEMISTRY OF MATERIALS Volume: 5 Issue: 4 Pages: 403-411 DOI:  
10.1021/cm00028a003 Published: APR 1993

34.Title: Structural and optical properties of PMMA films filled with different contents of iodine

Author(s): Zidan, H. M.; Abdelrazek, E. M.

Source: Inter. J. Poly. Mater. Volume: 54 Pages: 1073-1085 DOI: 10.1080/009140390901482  
Published: 2005

35.Title: Structural and optical properties of pure PMMA and metal chloride-doped PMMA films

Author(s): Zidan, HM; Abu-Elnader, M

Source: PHYSICA B-CONDENSED MATTER Volume: 355 Issue: 1-4 Pages: 308-317  
DOI: 10.1016/j.physb.2004.11.023 Abstract Number: A2005-16-7865T-004 Published: JAN  
31 2005

## Inter-comparison study between human and cow teeth enamel for low dose measurement using ESR

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### Abstract:

Human and cow teeth enamel samples were separated and irradiated with gamma-ray to study radiation-induced radicals as dosimetric material with electron spin resonance (ESR). The enamel spectrum is characterized by two main g-factors g parallel to = 1.9976 and g perpendicular to = 2.0019. The dosimetric signal for enamel at g = 2.0019 is ascribed to CO(2)(-) radicals. The dose response was studied in the range from 200 mGy to 2 Gy. Power dependence, energy dependence and thermal stability had been studied also to determine the optimum conditions for ESR measurements and stability of the signal at room temperature as well. Radical formation efficiency (G-value) of 0.44 +/- 0.09 and 0.65 +/- 0.13 was obtained for human enamel and cow enamel, respectively. The life time for human enamel and cow enamel were estimated from Arrhenius plot to be 1.1 x 10(7) years and 7 x 10(6) years, respectively. The activation energy for human enamel and cow enamel were also calculated from Arrhenius plot to be 1.23 eV and 1.15 eV, respectively. The dose conversion factors for enamel in water and air were calculated to be 0.901 D(water) and 0.998 D(air). The combined and expanded uncertainties accompanying these measurements are +/- 5.79% and +/- 11.58%, respectively. (C) 2010 Elsevier B.V. All rights reserved.

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### References:

1. Title: A general theory of cavity ionisation.

Author(s): Burlin, T E

Source: The British journal of radiology Volume: 39 Issue: 466 Pages: 727-34 Abstract  
Number: B1967-14429; A1967-00977 Published: 1966-Oct

2. Title: EFFECT OF WALL ON FRICKE DOSEMETER

Author(s): BURLIN, TE; CHAN, FK

Source: INTERNATIONAL JOURNAL OF APPLIED RADIATION AND ISOTOPES  
Volume: 20 Issue: 11 Pages: 767-& DOI: 10.1016/0020-708X(69)90040-4 Abstract  
Number: A1970-038073 Published: 1969

3. Title: EPR of carbonate derived radicals: Applications in dosimetry, dating and detection of  
irradiated food

Author(s): Callens, F; Vanhaelewyn, G; Matthys, P; et al.

Source: APPLIED MAGNETIC RESONANCE Volume: 14 Issue: 2-3 Pages: 235-254  
Published: 1998

4. Title: Synthesis of calcium phosphates and porous hydroxyapatite beads prepared by emulsion  
method

Author(s): Chen, Bing-Hung; Chen, Kang-I; Ho, Mei-Ling; et al.

Source: MATERIALS CHEMISTRY AND PHYSICS Volume: 113 Issue: 1 Pages: 365-371  
DOI: 10.1016/j.matchemphys.2008.06.040 Published: JAN 15 2009

5. Title: SPECTRAL ENERGY EFFECTS IN ESR BONE DOSIMETRY - PHOTONS AND  
ELECTRONS

Author(s): COPELAND, JF; KASE, KR; CHABOT, GE; et al.

Conference: 3RD INTERNATIONAL SYMP ON ESR ( ELECTRON SPIN RESONANCE )

DOSIMETRY AND APPLICATIONS Location: NIST, GAITHERSBURG, MD Date: OCT 14-18, 1991

Sponsor(s): US DEPT COMMERCE; US DEF NUCL AGCY; US DOE

Source: APPLIED RADIATION AND ISOTOPES Volume: 44 Issue: 1-2 Pages: 101-106

DOI: 10.1016/0969-8043(93)90204-N Published: JAN-FEB 1993

6. Title: Study of the ESR signal of gamma irradiated hydroxyapatite for dose assessment

Author(s): Da Costa, ZM; Pontuschka, WM; Campos, LL

Conference: 12th International Conference on Radiation Effects in Insulators Location:

Gramado, BRAZIL Date: AUG 31-SEP 05, 2003

Sponsor(s): UFRGS; FAPERGS; CNPQ; FINEP; Elsevier; High Voltage Engn Europa BV

Source: NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION B-BEAM INTERACTIONS WITH MATERIALS AND ATOMS Volume: 218 Pages: 283-288

DOI: 10.1016/j.nimb.2003.11.001 Abstract Number: A2004-23-8760M-010 Published: JUN 2004

7. Title: Electron paramagnetic resonance (EPR) biodosimetry

Author(s): Desrosiers, M; Schauer, DA

Conference: Summer School on Advanced Topics in Radiation Dosimetry Location: ATHENS, GREECE Date: JUL 03-07, 2001

Sponsor(s): St Gobain Crystals & Detectors

Source: NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION B-BEAM INTERACTIONS WITH MATERIALS AND ATOMS Volume: 184 Issue: 1-2

Pages: 219-228 DOI: 10.1016/S0168-583X(01)00614-0 Abstract Number: A2001-24-8760I-012; B2001-12-7510N-080 Published: SEP 2001

8. Title: THE MINERAL IN BONE, DENTIN AND TOOTH ENAMEL

Author(s): DRIESSENS, FCM

Source: BULLETIN DES SOCIETES CHIMIQUES BELGES Volume: 89 Issue: 8 Pages: 663-689 Published: 1980

9. Title: Comparison of gamma- and UV-light-induced EPR spectra of enamel from deciduous molar teeth

Author(s): El-Faramawy, NA

Conference: 6th International Symposium on ESR Dosimetry and Applications Location:

Campos do Jordao, BRAZIL Date: OCT 12-16, 2003

Source: APPLIED RADIATION AND ISOTOPES Volume: 62 Issue: 2 Pages: 191-195

DOI: 10.1016/j.apradiso.2004.08.011 Abstract Number: A2005-19-8760I-024 Published: FEB 2005

10. Title: [not available]

Author(s): FLEMING I

Source: SPECTROSCOPIC METHOD Published: 1996 11. Title: Radical formation in lithium and magnesium oxalate

Author(s): Hassan, GM; Ulusoy, U; Ikeya, M

Source: JAPANESE JOURNAL OF APPLIED PHYSICS PART 1-REGULAR PAPERS SHORT NOTES & REVIEW PAPERS Volume: 39 Issue: 11 Pages: 6236-6242 DOI: 10.1143/JJAP.39.6236 Abstract Number: A2001-03-8230-012 Published: NOV 2000

12. Title: A new ESR dosimeter based on bioglass material

Author(s): Hassan, GM; Sharaf, MA; Desouky, OS

Source: RADIATION MEASUREMENTS Volume: 38 Issue: 3 Pages: 311-315 DOI: 10.1016/j.radmeas.2004.01.020 Published: JUN 2004

13. Title: Use of electron paramagnetic resonance dosimetry with tooth enamel for retrospective dose assessment

Group Author(s): IAEA

Source: IAEA-TECDOC-1331 Pages: 57 Published: 2002

Publisher: International Atomic Energy Agency

14. Title: Stopping powers for electrons and positrons

Group Author(s): ICRU

Source: ICRU Report 37 Published: 1984

Publisher: International Commission on Radiation Units and Measurements, Bethesda, MD

15. Title: [not available]

Author(s): Ikeya, M.

Source: New Applications of Electron Spin Resonance Published: 1993

Publisher: World Scientific, Singapore

16. Title: [not available]

Group Author(s): ISO, IEC, BIPM, OIML

Source: Guide to the Expression of Uncertainty in Measurements Published: 1995

17. Title: Wide-scale EPR retrospective dosimetry: Results and problems

Author(s): Ivannikov, AI; Skvortzov, VG; Stepanenko, VF; et al.

Source: RADIATION PROTECTION DOSIMETRY Volume: 71 Issue: 3 Pages: 175-180

Abstract Number: A1997-16-8760M-009 Published: 1997

18. Title: Controlled assembly of Poly(D,L-lactide-co-glycolide)/hydroxyapatite core-shell nanospheres under ultrasonic irradiation

Author(s): Jevtic, M.; Radulovic, A.; Ignjatovic, N.; et al.

Source: ACTA BIOMATERIALIA Volume: 5 Issue: 1 Pages: 208-218 DOI:

10.1016/j.actbio.2008.07.026 Published: JAN 2009



19. Title: Relationships between ESR-evaluated doses estimated from enamel and activity of radionuclides in bone and teeth of reindeer

Author(s): Klevezal, GA; Serezhenkov, VA; Bakhur, AE

Source: APPLIED RADIATION AND ISOTOPES Volume: 50 Issue: 3 Pages: 567-572

DOI: 10.1016/S0969-8043(98)00067-0 Published: MAR 1999

20. Title: The dosimetry of beta sources in tissue; the point-source function.

Author(s): LOEVINGER, R

Source: Radiology Volume: 66 Issue: 1 Pages: 55-62 Abstract Number: A1957-01560

Published: 1956-Jan

21. Title: MAXIMUM-LIKELIHOOD COMMON-FACTOR ANALYSIS AS A POWERFUL TOOL IN DECOMPOSING MULTICOMPONENT EPR POWDER SPECTRA

Author(s): MOENS, P; DEVOLDER, P; HOOGEWIJS, R; et al.

Source: JOURNAL OF MAGNETIC RESONANCE SERIES A Volume: 101 Issue: 1 Pages: 1-15 DOI: 10.1006/jmra.1993.1001 Abstract Number: A1993-15-0758-001 Published: JAN 1993

22. Title: Contamination from possible solar light exposures in ESR dosimetry using human tooth enamel

Author(s): Nakamura, N; Katanic, JF; Miyazawa, C

Source: JOURNAL OF RADIATION RESEARCH Volume: 39 Issue: 3 Pages: 185-191

DOI: 10.1269/jrr.39.185 Abstract Number: A1999-10-8760M-007 Published: SEP 1998

23. Title: The effects of UV-irradiation on ESR-dosimetry of tooth enamel

Author(s): Nilsson, J; Lund, E; Lund, A

Source: APPLIED RADIATION AND ISOTOPES Volume: 54 Issue: 1 Pages: 131-139

DOI: 10.1016/S0969-8043(99)00275-4 Abstract Number: A2001-06-8760M-004 Published: JAN 2001

24. Title: [not available]

Author(s): POROIKOV IV

Source: ROENTGENOMETRY GOSTE Published: 1950

25. Title: Current issues on EPR dose reconstruction in tooth enamel

Author(s): Romanyukha, AA; Desrosiers, MF; Regulla, DF

Conference: International Conference on Biodosimetry Location: RUSSIAN ACAD MED SCI, MED RADIOL RES CTR, MOSCOW, RUSSIA Date: JUN 22-26, 1998

Sponsor(s): WHO; Int Atom Energy Agcy; European Commiss; US DOE; Chinese Acad Med Sci; Radiat Effects Res Fdn; Natl Res Ctr Environm & Hlth; German Fed Off Radiat Protect; German Res Ctr Air & Space, German Fed Minist Educ & Res, Int Bur; Bavarian State Minist

Reg Dev & Environm Affairs; Russian Acad Sci; Russian Federat, State Comm Sci & Technol; Russian Acad Med Sci; Russian Federat, Minist Hlth; Russian Federat, Minist Atom Energy; Russian Assoc Radiol Problems; Govt Kaluga Oblast  
Source: APPLIED RADIATION AND ISOTOPES Volume: 52 Issue: 5 Pages: 1265-1273  
DOI: 10.1016/S0969-8043(00)00082-8 Abstract Number: A2000-17-8760M-007 Published: MAY 2000

26. Title: Geographic variations in the EPR spectrum of tooth enamel

Author(s): Romanyukha, AA; Hayes, RB; Haskell, EH; et al.

Conference: 12th International Conference on Solid State Dosimetry Location: BURGOS, SPAIN Date: JUL 05-10, 1998

Sponsor(s): Bicron Technol; Bubble Technol Ind; Caja Burgos; Comis Interminist Cienc & Tecnolog; Consejo Seguridad Nucl; Direcc Gen Investigacion Cienc & Tecnol; Empresa Nacl Residuos SA; Excmo Ayuntamiento Burgos; Excmo Diputac Province Burgos; Landauer Inc; Nucl Technol Publishing; Siemens Environm Syst Ltd; Stillwater Sci LLC; Studsvik Instrument AB

Source: RADIATION PROTECTION DOSIMETRY Volume: 84 Issue: 1-4 Pages: 445-449  
Part: Part 1 Abstract Number: A1999-19-8760M-005 Published: 1999

27. Title: EPR DOSIMETRY OF CORTICAL BONE AND TOOTH ENAMEL IRRADIATED WITH X-RAYS AND GAMMA-RAYS - STUDY OF ENERGY-DEPENDENCE

Author(s): SCHAUER, DA; DESROSIERS, MF; LE, FG; et al.

Source: RADIATION RESEARCH Volume: 138 Issue: 1 Pages: 1-8 DOI: 10.2307/3578840  
Abstract Number: A1994-14-8760M-003 Published: APR 1994

28. Title: ELECTRON-SPIN-RESONANCE STUDIES OF TOOTH ENAMEL

Author(s): SCHWARCZ, HP

Source: NUCLEAR TRACKS AND RADIATION MEASUREMENTS Volume: 10 Issue: 4-6  
Pages: 865-867 DOI: 10.1016/0735-245X(85)90101-2 Abstract Number: A1986-051809  
Published: 1985

29. Title: BREMSSTRAHLUNG SPECTRA FROM ELECTRON INTERACTIONS WITH SCREENED ATOMIC-NUCLEI AND ORBITAL ELECTRONS

Author(s): SELTZER, SM; BERGER, MJ

Source: NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION B-BEAM INTERACTIONS WITH MATERIALS AND ATOMS Volume: 12 Issue: 1 Pages: 95-134  
DOI: 10.1016/0168-583X(85)90707-4 Abstract Number: A1985-119591 Published: 1985

30. Title: CALCULATION OF PHOTON MASS ENERGY-TRANSFER AND MASS ENERGY-ABSORPTION COEFFICIENTS  
Author(s): SELTZER, SM  
Source: RADIATION RESEARCH Volume: 136 Issue: 2 Pages: 147-170 DOI: 10.2307/3578607 Abstract Number: A1994-03-8760M-002 Published: NOV 1993
31. Title: Estimation of accumulated dose of radiation by the method of ESR-spectrometry of dental enamel of mammals  
Author(s): Serezhenkov, VA; Moroz, IA; Klevezal, GA; et al.  
Conference: 4th International Symposium on ESR Dosimetry and Applications Location: MUNICH, GERMANY Date: MAY 15-19, 1995  
Sponsor(s): GSF; IAEA; WHO; Russian Acad Sci  
Source: APPLIED RADIATION AND ISOTOPES Volume: 47 Issue: 11-12 Pages: 1321-1328 DOI: 10.1016/S0969-8043(96)00199-6 Abstract Number: A1997-06-8760M-027 Published: NOV-DEC 1996
32. Title: ESR dosimetric properties of modern coral reef  
Author(s): Sharaf, MA; Hassan, GM  
Source: NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION B-BEAM INTERACTIONS WITH MATERIALS AND ATOMS Volume: 217 Issue: 4 Pages: 603-610 DOI: 10.1016/j.nimb.2003.11.088 Abstract Number: A2005-01-8750G-006; B2005-01-7530B-010 Published: JUN 2004
33. Title: Gamma-ray dose response of ESR signals in tooth enamel of cows and mice in comparison with human teeth  
Author(s): Toyoda, S; Tanizawa, H; Romanyukha, AA; et al.  
Conference: 10th International Conference on Luminescence and Electron Spin Resonance Dating (LED 2002) Location: RENO, NEVADA Date: JUN 24-28, 2002  
Source: RADIATION MEASUREMENTS Volume: 37 Issue: 4-5 Special Issue: SI Pages: 341-346 DOI: 10.1016/S1350-4487(03)00059-3 Abstract Number: A2004-07-8760M-027; B2004-04-7530B-026 Published: AUG-OCT 2003
34. Title: [not available]  
Author(s): TOYODA S  
Source: RADIAT RES Volume: 47 Pages: 71 Published: 2006
35. Title: [not available]  
Author(s): \*IAEA  
Source: TECHN REP SER IAEA Volume: 381 Published: 1997

## Structural, optical, thermal and electrical studies on PVA/PVP blends filled with lithium bromide

**Author(s):** [Abdelrazek, EM](#) (Abdelrazek, E. M.)<sup>[2]</sup>; [Elashmawi, IS](#) (Elashmawi, I. S.)<sup>[1]</sup>; [El-Khodary, A](#) (El-Khodary, A.)<sup>[2]</sup>; [Yassin, A](#) (Yassin, A.)<sup>[2]</sup>

Source: CURRENT APPLIED PHYSICS Volume: 10 Issue: 2 Pages: 607-613 DOI: 10.1016/j.cap.2009.08.005 Published: MAR 2010

### Abstract:

Films of PVA/PVP blend (50/50) filled with different concentrations of LiBr were prepared. The prepared films were investigated by different techniques. XRD scans demonstrate that complexation between the filler and the blend takes place in the amorphous region. UV-VIS analysis revealed that the values of the optical energies are changed with increase Li-ions content. This indicates that there is a charge transfer complexes arise between the polymer blend and Li-ions. The thermal stability of the product samples has improved after filling LiBr increases, this indicates that the filler acts as a plasticizer. The rise of the conductivity is significant with increased concentration of LiBr, this is means the decrease in the degree of crystallinity and increase in the degree of amorphosity. This suggests the choice of LiBr as filler to improve the electrical conductivity of PVA/PVP. (C) 2009 Elsevier B.V. All rights reserved.

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## References:

1. Title: Characterization and physical properties of CoCl<sub>2</sub> filled polyethyl-methacrylate films  
Author(s): Abdeirazek, E. M.; Elashmawi, I. S.  
Source: POLYMER COMPOSITES Volume: 29 Issue: 9 Pages: 1036-1043 DOI: 10.1002/pc.20491 Published: SEP 2008
2. Title: Effect of dopant mixture on structural, optical and electron spin resonance properties of polyvinyl alcohol  
Author(s): Abdelaziz, M.; Abdelrazek, E. M.  
Source: PHYSICA B-CONDENSED MATTER Volume: 390 Issue: 1-2 Pages: 1-9 DOI: 10.1016/j.physb.2006.07.067 Published: MAR 1 2007
3. Title: Spectroscopic studies on the effect of doping with CoBr<sub>2</sub> and MgCl<sub>2</sub> on some physical properties of polyvinylalcohol films  
Author(s): Abdelrazek, E. M.  
Source: PHYSICA B-CONDENSED MATTER Volume: 403 Issue: 12 Pages: 2137-2142 DOI: 10.1016/j.physb.2007.11.029 Published: JUN 1 2008
4. Title: Poly-ethers as solid electrolytes  
Author(s): Armand, M.B.; Chabagno, J.M.; Duclot, M.J.  
Book Editor(s): Vashishta, P.; Mundy, J.N.; Shenoy, G.K.  
Conference: Fast Ion Transport in Solids. Electrodes and Electrolytes Location: Lake Geneva, WI, USA Date: 21-25 May 1979  
Source: Fast Ion Transport in Solids. Electrodes and Electrolytes Pages: 131-6 Abstract Number: A1980-059708 Published: 1979
5. Title: [not available]  
Author(s): BARDEEN J  
Source: PHYS REV Volume: 75 Pages: 169 Published: 1949
6. Title: [not available]  
Author(s): Davis, D.S.; Shalliday, J.S.  
Source: Phys. Rev. Volume: 118 Pages: 1020-1022 Published: 1960
7. Title: [not available]  
Author(s): ELASHMAWI IS  
Source: POLYM ENG SCI Volume: 895 Pages: 48 Published: 2008
8. Title: Electrical conductivity studies on PVA/PVP-KOH alkaline solid polymer blend electrolyte  
Author(s): Hatta, FF; Yahya, MZA; Ali, AMM; et al.  
Conference: International Conference on Fucntional Materials and Devices Location: Kuala

Lumpur, MALAYSIADate: JUN 06-08, 2005

Source: IONICS Volume: 11 Issue: 5-6 Pages: 418-422 DOI: 10.1007/BF02430259

Published: 2005

9. Title: Thermal, electrical and Optical studies on the poly(vinyl alcohol) based polymer electrolytes

Author(s): Hirankumar, G; Selvasekarapandian, S; Kuwata, N; et al.

Source: JOURNAL OF POWER SOURCES Volume: 144 Issue: 1 Pages: 262-267 DOI:

10.1016/j.jpowsour.2004.12.019 Abstract Number: A2005-19-8630-002; B2005-10-8410-002

Published: JUN 1 2005

10. Title: THE EFFECT OF HYDROGEN-BONDING ON THE GLASS-TRANSITION TEMPERATURES OF POLYMER MIXTURES

Author(s): KWEI, TK

Source: JOURNAL OF POLYMER SCIENCE PART C-POLYMER LETTERS Volume: 22

Issue: 6 Pages: 307-313 DOI: 10.1002/pol.1984.130220603 Abstract Number: A1984-

103932 Published: 1984

11. Title: Spectroscopic characterization of molecular interdiffusion at a poly(vinyl pyrrolidone) vinyl ester interface

Author(s): Laot, CM; Marand, E; Oyama, HT

Source: POLYMER Volume: 40 Issue: 5 Pages: 1095-1108 DOI: 10.1016/S0032-

3861(98)80003-7 Abstract Number: A1999-05-6630N-001 Published: MAR 1999

12. Title: Miscibility of carboxyl-containing polysiloxane/poly(vinylpyridine) blends

Author(s): Li, X; Goh, SH; Lai, YH; et al.

Source: POLYMER Volume: 41 Issue: 17 Pages: 6563-6571 DOI: 10.1016/S0032-

3861(99)00896-4 Published: AUG 2000

13. Title: Morphology and gas permselectivity of blend membranes of polyvinylpyridine with ethylcellulose

Author(s): Li, XG; Kresse, I; Springer, J; et al.

Source: POLYMER Volume: 42 Issue: 16 Pages: 6859-6869 DOI: 10.1016/S0032-

3861(01)00057-X Published: JUL 2001

14. Title: [not available]

Author(s): LINFORD RG

Source: ELECTROCHEMICAL SCI Pages: CH3 Published: 1987

15. Title: Properties and structure of PVP-lignin "blend films"

Author(s): Liu, CH; Xiao, CB; Liang, H

Source: JOURNAL OF APPLIED POLYMER SCIENCE Volume: 95 Issue: 6 Pages: 1405-

1411 DOI: 10.1002/app.21367 Published: MAR 15 2005

16. Title: The characterization of dressing component materials and radiation formation of PVA-PVP hydrogel

Author(s): Razzak, MT; Zainuddin; Erizal; et al.

Source: RADIATION PHYSICS AND CHEMISTRY Volume: 55 Issue: 2 Pages: 153-165

DOI: 10.1016/S0969-806X(98)00320-X Published: JUN 1999

17. Title: Dielectric spectroscopy studies on (PVP plus PVA) polyblend film

Author(s): Reddy, CVS; Han, X; Zhu, QY; et al.

Source: MICROELECTRONIC ENGINEERING Volume: 83 Issue: 2 Pages: 281-285 DOI:

10.1016/j.mee.2005.08.010 Published: FEB 2006

18. Title: Electrical and optical properties of a polyblend electrolyte

Author(s): Reddy, CVS; Sharma, AK; Rao, VVRN

Source: POLYMER Volume: 47 Issue: 4 Pages: 1318-1323 DOI:

10.1016/j.polymer.2005.12.052 Published: FEB 8 2006

19. Title: OPTICAL-PROPERTIES OF THIN-FILMS OF CADMIUM AND ZINC SELENIDES AND TELLURIDES

Author(s): THUTUPALLI, GKM; TOMLIN, SG

Source: JOURNAL OF PHYSICS D-APPLIED PHYSICS Volume: 9 Issue: 11 Pages: 1639-

1646 DOI: 10.1088/0022-3727/9/11/010 Abstract Number: A1976-073206 Published: 1976

20. Title: Conductivity and thermal studies of solid polymer electrolytes prepared by blending polyvinylchloride, polymethylmethacrylate and lithium sulfate

Author(s): Uma, T; Mahalingam, T; Stimming, U

Source: MATERIALS CHEMISTRY AND PHYSICS Volume: 85 Issue: 1 Pages: 131-136

DOI: 10.1016/j.matchemphys.2003.12.012 Abstract Number: A2004-24-7360R-008

Published: MAY 15 2004

21. Title: [not available]

Author(s): Utracki, L.A.

Source: Polymer Alloys and Blends Published: 1990

Publisher: Carl Hanser Verlag, Munich

22. Title: The temperature dependence law of the viscosity of fluids

Author(s): Vogel, H

Source: PHYSIKALISCHE ZEITSCHRIFT Volume: 22 Pages: 645-646 Abstract Number:

A1922-01084 Published: 1921

23. Title: MECHANICAL PROPERTIES OF SUBSTANCES OF HIGH MOLECULAR WEIGHT .19. THE TEMPERATURE DEPENDENCE OF RELAXATION MECHANISMS IN AMORPHOUS POLYMERS AND OTHER GLASS-FORMING LIQUIDS

Author(s): WILLIAMS, ML; LANDEL, RF; FERRY, JD

Source: JOURNAL OF THE AMERICAN CHEMICAL SOCIETY Volume: 77 Issue: 14  
Pages: 3701-3707 DOI: 10.1021/ja01619a008 Abstract Number: A1955-10019 Published:  
1955

24. Title: FTIR and TGA studies of poly(4-vinylpyridine-co-divinylbenzene)-Cu(II) complex

Author(s): Wu, KH; Wang, YR; Hwu, WH

Source: POLYMER DEGRADATION AND STABILITY Volume: 79 Issue: 2 Pages: 195-  
200 Article Number: PII S0141-3910(02)00261-6 DOI: 10.1016/S0141-3910(02)00261-6  
Published: FEB 2003

25. Title: Thermal degradation of blends of PVC with polysiloxane - 1

Author(s): Zulfiqar, S; Ahmad, S

Source: POLYMER DEGRADATION AND STABILITY Volume: 65 Issue: 2 Pages: 243-  
247 DOI: 10.1016/S0141-3910(99)00010-5 Published: 1999



## **Vibrational, thermal, optical and magnetic investigations of PVA films filled with FeCl<sub>3</sub> and CoCl<sub>2</sub>**

Author(s): [El-Khodary, A](#) (El-Khodary, A.)

Source: PHYSICA B-CONDENSED MATTER Volume: 404 Issue: 8-11 Pages: 1287-1294  
DOI: 10.1016/j.physb.2008.11.238 Published: MAY 1 2009

Abstract: PVA films filled with different mass fractions of X FeCl<sub>3</sub> (15-X) CoCl<sub>2</sub> were investigated, vibrationally, thermally, optically and magnetically. An assignment of the most notably infrared (IR) peaks was done. Significant vibrational deformations of certain IR peaks with filling were studied. The main characterizing temperatures were recorded, assigned and their FL dependence were studied using differential scanning calorimetric (DSC). The thermal analysis depicts better thermal properties of the filled polymer with increasing X that represents interesting industrial applications. The absorption peaks in the ultraviolet and visible regions were detected and assigned. Electron paramagnetic resonance (EPR) spectra are complicated and characterized by the hyperfine structure. The main features of the EPR investigations are the orbital contribution to the magnetic moment, the important role of the spin-orbit coupling, the localization of the paramagnetic centers as well as the ionic cluster formations. The linear temperature dependence of the reciprocal dc magnetic susceptibility obeys Curie-Weiss behavior characterized by localized magnetic moments. A correlation between vibrational, thermal, optical, and magnetic properties was done. (C) 2009 Elsevier B.V. All rights reserved.

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### References:

1. Title: [not available]

Author(s): Banwell, C. N.

Source: Fundamental of Molecular Spectroscopy Published: 1983

Publisher: McGRAW-HILL Book Company (U.K.) Limited, London

2. Title: [not available]

Author(s): Campbell, D; White, JR.

Source: <IT>Polymer Characterization, Physical Techniques</IT> Published: 1989

Publisher: Chapman and Hall, London

3. Title: A study of electron paramagnetic resonance and optical absorption in calcium manganese phosphate glasses containing praseodymium

Author(s): Chakradhar, RPS; Murali, A; Rao, JL

Source: JOURNAL OF MATERIALS SCIENCE Volume: 35 Issue: 2 Pages: 353-359 Published: JAN 2000

4. Title: [not available]

Author(s): Crangle, J.

Source: The Magnetic Properties of Solids Published: 1977

Publisher: Edward Arnold, London

5. Title: Magnetic quantum tunneling in the single-molecule magnet Mn-12-acetate

Author(s): del Barco, E; Kent, AD; Hill, S; et al.

Source: JOURNAL OF LOW TEMPERATURE PHYSICS Volume: 140 Issue: 1-2 Pages: 119-174  
DOI: 10.1007/s10909-005-6016-3 Published: JUL 2005

6. Title: The effect of MnCl<sub>2</sub> filler on the physical properties of polystyrene films

Author(s): El-Khodary, A

Source: PHYSICA B-CONDENSED MATTER Volume: 344 Issue: 1-4 Pages: 297-306 DOI:  
10.1016/j.physb.2003.10.010 Abstract Number: A2004-21-7865T-013 Published: FEB 15 2004

7. Title: [not available]

Author(s): FLEMING I

Source: SPECTROSCOPIC METHOD Published: 1996

8. Title: EFFECT OF DRAWING ON THE ALPHA-RELAXATION OF POLYVINYL-ALCOHOL)

Author(s): GARRETT, PD; GRUBB, DT

Source: JOURNAL OF POLYMER SCIENCE PART B-POLYMER PHYSICS Volume: 26 Issue: 12

Pages: 2509-2523 DOI: 10.1002/polb.1988.090261209 Abstract Number: A1989-032115 Published: NOV 1988

9. Title: [not available]

Author(s): HAHN BR

Source: POLYMER Volume: 26 Pages: 1511 Published: 1985

10. Title: METAMAGNETIC TRANSITION AND MAGNETOOPTICS IN CSCOCL<sub>3</sub>

Author(s): HORI, H; AMAYA, K; MIKAMI, H; et al.

Conference: 25TH CONF OF THE YAMADA SCIENCE FOUNDATION : MAGNETIC PHASE TRANSITIONS Location: OSAKA, JAPAN Date: APR 13-16, 1990

Sponsor(s): YAMADA SCI FDN

Source: JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS Volume: 90-1 Pages: 269-270 Abstract Number: A1991-061961 Published: DEC 1990

11. Title: Plasticizer effect on the melting and crystallization behavior of polyvinyl alcohol

Author(s): Jang, J; Lee, DK

Source: POLYMER Volume: 44 Issue: 26 Pages: 8139-8146 DOI: 10.1016/j.polymer.2003.10.015 Published: DEC 2003

12. Title: [not available]

Author(s): Jiles, D.

Source: Introduction to magnetism and magnetic materials Published: 1991

Publisher: Chapman and Hall, London

13. Title: THEORY OF ESR LINEWIDTHS OF FREE RADICALS

Author(s): KIVELSON, D

Source: JOURNAL OF CHEMICAL PHYSICS Volume: 33 Issue: 4 Pages: 1094-1106 DOI: 10.1063/1.1731340 Abstract Number: A1960-20663 Published: 1960

14. Title: ELECTRON HOPPING IN A SOLITON BAND - CONDUCTION IN LIGHTLY DOPED (CH)<sub>3</sub>N

Author(s): KIVELSON, S

Source: PHYSICAL REVIEW B Volume: 25 Issue: 6 Pages: 3798-3821 DOI: 10.1103/PhysRevB.25.3798 Published: 1982

15. Title: [not available]

Author(s): KUIVALAINEN P

Source: PHYS REV B Volume: 32 Pages: 7900 Published: 1985

16. Title: Spectroscopic investigations of Mn<sup>2+</sup> ions doped polyvinylalcohol films

Author(s): Kumar, GNH; Rao, JL; Gopal, NO; et al.

Source: POLYMER Volume: 45 Issue: 16 Pages: 5407-5415 DOI: 10.1016/j.polymer.2004.05.068 Published: JUL 22 2004

17. Title: [not available]

Author(s): Lu, Y.

Source: Solitons and Polarons in Conducting Polymers Published: 1988  
Publisher: World Scientific, Singapore

18. Title: Mechanism of dc conduction in polyaniline doped with sulfuric acid

Author(s): Luthra, V; Singh, R; Gupta, SK; et al.

Conference: India/Japan Workshop on New Advanced Materials in Molecular Electronics Location:  
NEW DELHI, INDIA Date: DEC 10-11, 2001

Source: CURRENT APPLIED PHYSICS Volume: 3 Issue: 2-3 Pages: 219-222 DOI: 10.1016/S1567-  
1739(02)00205-5 Published: APR 2003

19. Title: Effect of cycling on the magnetization of ion exchanged magnetic nanocomposite based on  
polystyrene

Author(s): Malini, KA; Anantharaman, MR; Sindhu, S; et al.

Source: JOURNAL OF MATERIALS SCIENCE Volume: 36 Issue: 4 Pages: 821-824 DOI:  
10.1023/A:1004805925431 Abstract Number: A2001-09-7560E-016 Published: FEB 2001

20. Title: [not available]

Author(s): MYERS RJ

Source: MOL MAGNETISM MAGNET Published: 1973

21. Title: MOLECULAR-MOTION IN A POLY(VINYL-ALCOHOL) CRYSTAL

Author(s): NAGURA, M; MATSUZAWA, S; YAMAURA, K; et al.

Source: POLYMER COMMUNICATIONS Volume: 24 Issue: 8 Pages: 250-253 Abstract Number:  
A1983-107562 Published: 1983

22. Title: [not available]

Author(s): NICHOLLS D

Source: COMPLEXES 1 TROW TRA Published: 1974

23. Title: [not available]

Author(s): PARK Y

Source: PHYS REV B Volume: 65 Published: 2002

24. Title: [not available]

Author(s): Pritchard, J.G.

Source: Poly (Vinyl Alcohol): Basic Properties and Uses Published: 1970

Publisher: Gordon & Breach, London

25. Title: Effect of salt concentration in poly(vinyl alcohol)-based solid polymer electrolytes

Author(s): Rajendran, S; Sivakumar, M; Subadevi, R

Source: JOURNAL OF POWER SOURCES Volume: 124 Issue: 1 Pages: 225-230 DOI:  
10.1016/S0378-7753(03)00591-3 Abstract Number: A2004-04-8245-036; B2004-02-8410E-122  
Published: OCT 1 2003

26. Title: [not available]

Author(s): Skomski, R.

Source: Simple Models of Magnetism Published: 2008

Publisher: Oxford University Press, Inc., New York

27. Title: [not available]

Author(s): SU I

Source: J POLYM SCI POL PHYS Volume: 33 Pages: 85 Published: 1995

28. Title: [not available]

Author(s): Tager, A.

Source: Physical Chemistry of Polymers Published: 1972

Publisher: Mir, Moscow

29. Title: ELECTRON-SPIN RESONANCE STUDIES OF MANGANESE(II) AND COPPER(II) SALTS OF POLY(ETHYLENE-CO-METHACRYLIC ACID)S

Author(s): TAKEI, M; TSUJITA, Y; SHIMADA, S; et al.

Source: JOURNAL OF POLYMER SCIENCE PART B-POLYMER PHYSICS Volume: 26 Issue: 5 Pages: 997-1008 DOI: 10.1002/polb.1988.090260505 Abstract Number: A1988-092605 Published: MAY 1988

30. Title: Structural, electrical and magnetic properties of polystyrene films filled with AgNO<sub>3</sub>-FeCl<sub>3</sub> mixed fillers

Author(s): Tawansi, A; El-Khodary, A; Youssef, AE

Source: JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS Volume: 283 Issue: 2-3 Pages: 199-209 DOI: 10.1016/j.jmmm.2004.05.021 Published: DEC 2004

31. Title: FECL<sub>3</sub> DOPED POLYVINYLIDENE FLUORIDE .2. PAULI SUSCEPTIBILITY AND MICROWAVE RESPONSE

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Source: JOURNAL OF MATERIALS SCIENCE Volume: 29 Issue: 15 Pages: 4001-4006 DOI: 10.1007/BF00355961 Abstract Number: A1994-20-7530C-013 Published: AUG 1 1994

32. Title: Short-range-order spin clusters in one-dimensional Ising-like antiferromagnetic CoBr<sub>2</sub>-filled PVA films: a study of physical properties

Author(s): Tawansi, A; Zidan, HM; Oraby, AH; et al.

Source: JOURNAL OF PHYSICS D-APPLIED PHYSICS Volume: 31 Issue: 24 Pages: 3428-3436 DOI: 10.1088/0022-3727/31/24/005 Abstract Number: A1999-08-7570-007 Published: DEC 21 1998

33. Title: ELECTRICAL-CONDUCTION OF POLY(VINYL-ALCOHOL) FILMS

Author(s): TAWANSI, A; MIGAHED, MD; ELHAMID, MIA

Source: JOURNAL OF POLYMER SCIENCE PART B-POLYMER PHYSICS Volume: 24 Issue: 12 Pages: 2631-2642 DOI: 10.1002/polb.1986.090241203 Abstract Number: A1987-045530 Published: DEC 1986

34. Title: Electron spin resonance, magnetic and optical properties of MnCl<sub>2</sub> filled PVC films

Author(s): Tawansi, A; Zidan, HM; Eldumiaty, AH

Source: POLYMER TESTING Volume: 17 Issue: 3 Pages: 211-224 DOI: 10.1016/S0142-9418(97)00058-5 Abstract Number: A1998-18-7630F-001 Published: 1998

35. Title: [not available]  
Author(s): Wunderlich, B.  
Source: Thermal analysis Published: 1990  
Publisher: Academic Press Inc, London

36. Title: [not available]  
Author(s): ZAINUDDIN DJT  
Source: RADIAT PHYS CHEM Volume: 62 Pages: 283 DOI: 10.1016/S0969-806X(01)00188-8  
Published: 2001

37. Title: Electron spin resonance and ultraviolet spectral analysis of UV-irradiated PVA films filled with MnCl<sub>2</sub> and CrF<sub>3</sub>  
Author(s): Zidan, HM  
Source: JOURNAL OF APPLIED POLYMER SCIENCE Volume: 88 Issue: 1 Pages: 104-111 DOI: 10.1002/app.11569 Abstract Number: A2003-15-6180B-001 Published: APR 4 2003

## Characterization, electrical and magnetic properties of PVA films filled with FeCl<sub>3</sub>-MnCl<sub>2</sub> mixed fillers

**Author(s):** [El-Khodary, A](#) (El-Khodary, A.)<sup>[1]</sup>; [Oraby, AH](#) (Oraby, A. H.)<sup>[1]</sup>; [Abdelnaby, MM](#) (Abdelnaby, M. M.)<sup>[1]</sup>

Source: JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS Volume: 320 Issue: 11  
Pages: 1739-1746 DOI: 10.1016/j.jmmm.2008.01.030 Published: JUN 2008

**Abstract:** Polyvinyl alcohol (PVA) films filled with different filling levels (FLs) of XFeCl<sub>3</sub>(15-X) MnCl<sub>2</sub> were studied. The DSC thermograms exhibited an increase in the melting temperature with. lling, indicating better thermal stability of the filled polymer of interesting industrial applications. The amorphous feature of the filled polymer was depicted using XRD scans. Vibrational studies displayed significant structural deformations. The FL dependence of certain IR absorption peaks was discussed. The dc electrical conduction mechanism was interpreted on the basis of the modified inter-polaron hopping model. The present results of the dc magnetic susceptibility ( $\chi$ ) suggested the temperature dependence of Curie-Weiss behavior characterized by localized magnetic moments. The effective paramagnetic moment ( $\mu(\text{eff})$ ) was estimated; its dependence on the FL exhibited a non-linear character. The electron spin resonance (ESR) study revealed unresolved broad distorted signals characterized by the hyperfine structure. The ESR parameters were evaluated. A correlation between the above-mentioned studies was discussed to relate the structural, electrical and magnetic properties of the filled PVA polymer. (C) 2008 Elsevier B.V. All rights reserved.

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**Author Keywords:** polyvinyl alcohol; FeCl<sub>3</sub> and MnCl<sub>2</sub> mixed fillers; characterization; electrical resistivity; magnetic susceptibility; electron spin resonances

**KeyWords Plus:** PHYSICAL-PROPERTIES; POLY(VINYLLIDENE FLUORIDE); POLYVINYLLIDENE FLUORIDE; PARAMAGNETIC-RESONANCE; OPTICAL-ABSORPTION; POLYSTYRENE FILMS; POLYPARAPHENYLENE; POLYACETYLENE; CONDUCTION; CLUSTERS

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### References:

1. Title: [not available]

Author(s): Banwell, C. N.

Source: Fundamental of Molecular Spectroscopy Published: 1983

Publisher: McGRAW-HILL Book Company (U.K.) Limited, London

2. Title: [not available]

Author(s): BODOR G

Source: STRUCTURAL INVESTIGA Published: 1991

3. Title: THEORETICAL-STUDIES OF CHARGED DEFECT STATES IN DOPED  
POLYACETYLENE AND POLYPARAPHENYLENE

Author(s): BREDAS, JL; CHANCE, RR; SILBEY, R  
Source: MOLECULAR CRYSTALS AND LIQUID  
CRYSTALS Volume: 77 Issue: 1-4 Pages: 319-332 DOI: 10.1080/00268948108075251 Abstract  
Number: A1982-045902 Published: 1981

4. Title: COMPARATIVE THEORETICAL-STUDY OF THE DOPING OF CONJUGATED  
POLYMERS - POLARONS IN POLYACETYLENE AND POLYPARAPHENYLENE

Author(s): BREDAS, JL; CHANCE, RR; SILBEY, R

Source: PHYSICAL REVIEW B Volume: 26 Issue: 10 Pages: 5843-5854 DOI:  
10.1103/PhysRevB.26.5843 Published: 1982

5. Title: A study of electron paramagnetic resonance and optical absorption in calcium manganese  
phosphate glasses containing praseodymium

Author(s): Chakradhar, RPS; Murali, A; Rao, JL

Source: JOURNAL OF MATERIALS SCIENCE Volume: 35 Issue: 2 Pages: 353-359 Published:  
JAN 2000

6. Title: [not available]

Author(s): Crangle, J.

Source: The Magnetic Properties of Solids Published: 1977

Publisher: Edward Arnold, London

7. Title: Magnetic quantum tunneling in the single-molecule magnet Mn-12-acetate

Author(s): del Barco, E; Kent, AD; Hill, S; et al.

Source: JOURNAL OF LOW TEMPERATURE PHYSICS Volume: 140 Issue: 1-2 Pages: 119-174  
DOI: 10.1007/s10909-005-6016-3 Published: JUL 2005



8. Title: High-frequency resonant experiments in Fe-8 molecular clusters  
Author(s): del Barco, E; Hernandez, JM; Tejada, J; et al.  
Source: PHYSICAL REVIEW B Volume: 62 Issue: 5 Pages: 3018-3021 Abstract Number: A2000-19-7560J-015 Published: AUG 1 2000
9. Title: [not available]  
Author(s): EFROS AL  
Source: J PHYS C SOLID STATE Volume: 8 Pages: 149 Published: 1979
10. Title: The effect of MnCl<sub>2</sub> filler on the physical properties of polystyrene films  
Author(s): El-Khodary, A  
Source: PHYSICA B-CONDENSED MATTER Volume: 344 Issue: 1-4 Pages: 297-306 DOI: 10.1016/j.physb.2003.10.010 Abstract Number: A2004-21-7865T-013 Published: FEB 15 2004
11. Title: [not available]  
Author(s): FLEMING I  
Source: SPECTROSCOPIC METHOD Published: 1996
12. Title: ELECTRICAL CONDUCTIVITY IN POLY(VINYL CHLORIDE)  
Author(s): FLEMING, RJ; RANICAR, JH  
Source: JOURNAL OF MACROMOLECULAR SCIENCE-CHEMISTRY Volume: A 4 Issue: 5  
Pages: 1223-& DOI: 10.1080/00222337008061015 Published: 1970
13. Title: [not available]  
Author(s): GESCHWIND S  
Source: ELECT PARAMAGNETIC R Published: 1972
14. Title: [not available]  
Author(s): Jiles, D.  
Source: Introduction to magnetism and magnetic materials Published: 1991  
Publisher: Chapman and Hall, London
15. Title: [not available]  
Author(s): KAHOL PK  
Source: SOLID STATE COMMUN Volume: 117 Pages: 37 Published: 2001
16. Title: DOUBLE INJECTION IN SOLIDS WITH NON-OHMIC CONTACTS .1. SOLIDS WITHOUT DEFECTS  
Author(s): KAO, KC  
Source: JOURNAL OF PHYSICS D-APPLIED PHYSICS Volume: 17 Issue: 7 Pages: 1433-1448  
DOI: 10.1088/0022-3727/17/7/017 Abstract Number: A1984-088563; B1984-046868 Published: 1984
17. Title: [not available]  
Author(s): Kittel, C.  
Source: Introduction to Solid State Physics Published: 1976  
Publisher: Wiley

18. Title: THEORY OF ESR LINEWIDTHS OF FREE RADICALS  
Author(s): KIVELSON, D  
Source: JOURNAL OF CHEMICAL PHYSICS Volume: 33 Issue: 4 Pages: 1094-1106 DOI:  
10.1063/1.1731340 Abstract Number: A1960-20663 Published: 1960
19. Title: ELECTRON HOPPING IN A SOLITON BAND - CONDUCTION IN LIGHTLY DOPED  
(CH)<sub>3</sub>N  
Author(s): KIVELSON, S  
Source: PHYSICAL REVIEW B Volume: 25 Issue: 6 Pages: 3798-3821 DOI:  
10.1103/PhysRevB.25.3798 Published: 1982
20. Title: [not available] Author(s): KUIVALAINEN P  
Source: PHYS REV B Volume: 32 Pages: 7900 Published: 1985
21. Title: Spectroscopic investigations of Mn<sup>2+</sup> ions doped polyvinylalcohol films  
Author(s): Kumar, GNH; Rao, JL; Gopal, NO; et al.  
Source: POLYMER Volume: 45 Issue: 16 Pages: 5407-5415 DOI: 10.1016/j.polymer.2004.05.068  
Published: JUL 22 2004
22. Title: Mechanism of dc conduction in polyaniline doped with sulfuric acid  
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Conference: India/Japan Workshop on New Advanced Materials in Molecular Electronics Location:  
NEW DELHI, INDIA Date: DEC 10-11, 2001  
Source: CURRENT APPLIED PHYSICS Volume: 3 Issue: 2-3 Pages: 219-222 DOI: 10.1016/S1567-  
1739(02)00205-5 Published: APR 2003
23. Title: [not available]  
Author(s): MOTT NF  
Source: ELECT PROCESS IONIC Published: 1940
24. Title: [not available]  
Author(s): MYERS RJ  
Source: MOL MAGNETISM MAGNET Published: 1973
25. Title: [not available]  
Author(s): Nicholls, D.  
Source: Complexes and First-Row Transition Elements Published: 1974  
Publisher: Macmillan Press, London
26. Title: Effects of D-strain, g-strain, and dipolar interactions on EPR linewidths of the molecular  
magnets Fe-8 and Mn-12  
Author(s): Park, K; Novotny, MA; Dalal, NS; et al.  
Source: PHYSICAL REVIEW B Volume: 65 Issue: 1 Article Number: 014426 DOI:

10.1103/PhysRevB.65.014426 Published: JAN 1 2002

27. Title: CHARGE-TRANSPORT AND ELECTRON LOCALIZATION IN POLYANILINE DERIVATIVES

Author(s): PINTO, NJ; KAHOL, PK; MCCORMICK, BJ; et al.

Source: PHYSICAL REVIEW B Volume: 49 Issue: 19 Pages: 13983-13986 DOI:

10.1103/PhysRevB.49.13983 Published: MAY 15 1994

28. Title: [not available]

Author(s): Pritchard, J.G.

Source: Poly (Vinyl Alcohol): Basic Properties and Uses Published: 1970

Publisher: Gordon & Breach, London

29. Title: Effect of salt concentration in poly(vinyl alcohol)-based solid polymer electrolytes

Author(s): Rajendran, S; Sivakumar, M; Subadevi, R

Source: JOURNAL OF POWER SOURCES Volume: 124 Issue: 1 Pages: 225-230 DOI:

10.1016/S0378-7753(03)00591-3 Abstract Number: A2004-04-8245-036; B2004-02-8410E-122

Published: OCT 1 2003

30. Title: Electron paramagnetic resonance and optical absorption spectra of Fe(III) ions in alkali zinc borosulphate

Author(s): Rao, JL; Murali, A; Rao, ED

Source: JOURNAL OF NON-CRYSTALLINE SOLIDS Volume: 202 Issue: 3 Pages: 215-221

Abstract Number: A1996-22-7630F-004 Published: JUL 1996

31. Title: [not available]

Author(s): SU I

Source: J POLYM SCI POL PHYS Volume: 33 Pages: 85 Published: 1995

32. Title: [not available]

Author(s): TAGER A

Source: PHYS CHEMISTRY POLYM Published: 1972

33. Title: [not available]

Author(s): TAWANSI A

Source: INTER J POLYM MAT Volume: 54 Pages: 1 Published: 2005

34. Title: Effect of valence electron spin polarization on the physical properties of CuCl<sub>2</sub>-filled poly(vinylidene fluoride) as a microwave modulator

Author(s): Tawansi, A; Ayad, MI; Abdel-Razek, EM

Source: JOURNAL OF APPLIED POLYMER SCIENCE Volume: 72 Issue: 6 Pages: 771-781 DOI:

10.1002/(SICI)1097-4628(19990509)72:6<771::AID-APP5>3.0.CO;2-O Published: MAY 9 1999

35. Title: Structural, electrical and magnetic properties of polystyrene films filled with AgNO<sub>3</sub>-FeCl<sub>3</sub> mixed fillers

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Source: JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS Volume: 283 Issue: 2-3  
Pages: 199-209 DOI: 10.1016/j.jmmm.2004.05.021 Published: DEC 2004

36. Title: FECL<sub>3</sub> DOPED POLYVINYLIDENE FLUORIDE .2. PAULI SUSCEPTIBILITY AND MICROWAVE RESPONSE

Author(s): TAWANSI, A; ABDELKADER, HI; BALACHANDRAN, W; et al.

Source: JOURNAL OF MATERIALS SCIENCE Volume: 29 Issue: 15 Pages: 4001-4006 DOI: 10.1007/BF00355961 Abstract Number: A1994-20-7530C-013 Published: AUG 1 1994

37. Title: FECL<sub>3</sub>-DOPED POLYVINYLIDENE FLUORIDE .1. INTERPOLARON HOPPING AND OPTICAL-PROPERTIES

Author(s): TAWANSI, A; ABDELKADER, HI; ELZALABANY, M; et al.

Source: JOURNAL OF MATERIALS SCIENCE Volume: 29 Issue: 13 Pages: 3451-3457 DOI: 10.1007/BF00352048 Abstract Number: A1994-19-7215N-001 Published: JUL 1 1994

38. Title: Short-range-order spin clusters in one-dimensional Ising-like antiferromagnetic CoBr<sub>2</sub>-filled PVA films: a study of physical properties

Author(s): Tawansi, A; Zidan, HM; Oraby, AH; et al.

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39. Title: Effect of one-dimensional phenomena on electrical, magnetic and ESR properties of MnCl<sub>2</sub>-filled PVA films

Author(s): Tawansi, A; Oraby, AH; Zidan, HM; et al.

Source: PHYSICA B Volume: 254 Issue: 1-2 Pages: 126-133 DOI: 10.1016/S0921-4526(98)00414-1 Abstract Number: A1999-01-7630F-003 Published: NOV 1998

40. Title: Physical properties and beta-phase increment of AgNO<sub>3</sub>-filled poly(vinylidene fluoride) films

Author(s): Tawansi, A; Oraby, AH; Badr, SI; et al.

Source: POLYMER INTERNATIONAL Volume: 53 Issue: 4 Pages: 370-377 DOI: 10.1002/pi.1325 Abstract Number: A2004-19-7865T-008 Published: APR 2004

41. Title: Preparation and properties of poly(vinyl alcohol)-clay nanocomposite materials

Author(s): Yu, YH; Lin, CY; Yeh, JM; et al.

Source: POLYMER Volume: 44 Issue: 12 Pages: 3553-3560 DOI: 10.1016/S0032-3861(03)00062-4 Published: JUN 2003

42. Title: [not available]

Author(s): ZAINUDDIN DJT

Source: RADIAT PHYS CHEM Volume: 62 Pages: 283 DOI: 10.1016/S0969-806X(01)00188-8 Published: 2001

43. Title: Electron spin resonance and ultraviolet spectral analysis of UV-irradiated PVA films filled with MnCl<sub>2</sub> and CrF<sub>3</sub>

Author(s): Zidan, HM

Source: JOURNAL OF APPLIED POLYMER SCIENCE Volume: 88 Issue: 1 Pages: 104-111 DOI: 10.1002/app.11569 Abstract Number: A2003-15-6180B-001 Published: APR 4 2003

### **A study of the physical properties of FeCl<sub>3</sub> filled PVA**

**Author(s):** [Tawansi, A](#) (Tawansi, A); [El-Khodary, A](#) (El-Khodary, A); [Abdenaby, MM](#) (Abdenaby, MM)

Source: CURRENT APPLIED PHYSICS Volume: 5 Issue: 6 Pages: 572-578 DOI: 10.1016/j.cap.2004.06.026 Published: SEP 2005

#### **Abstract:**

Polyvinyl alcohol (PVA) films filled with various mass fractions of FeCl<sub>3</sub> were prepared using a casting method. The structural, electrical and magnetic properties were clarified. The filling level (FL) dependence of certain IR absorption peaks was correlated with the obtained physical parameter characterizing the other properties. The XRD scans revealed a semicrystalline feature of the virgin polymer and an existence of two halos. The FL dependence of the intensity of the two halos was studied. The dc electrical resistivity was measured in the temperature range of 300-400 K. An intrachain one-dimensional interpolaron hopping mechanism was assumed to interpret the electrical conduction. The temperature dependence of the dc magnetic susceptibility exhibited a Curie-Weiss behavior in the range of 90-270 K. The ESR studies of PVA filled with various mass fractions of FeCl<sub>3</sub> revealed very complicated spectra due to hyperfine and fine structure. The evolution of the ESR spectra with the FL suggested the distribution of Fe<sup>3+</sup> ions in isolated and then aggregated modes within the PVA matrix. (C) 2004 Elsevier B.V. All rights reserved.

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Author Keywords: FeCl<sub>3</sub> filled PVA; infrared; X-ray diffraction; electrical conduction; magnetic susceptibility; electron spin resonance

**KeyWords Plus:** ELECTRON-SPIN-RESONANCE; POLY(VINYL ALCOHOL); MAGNETIC-PROPERTIES; PARAMAGNETIC-RESONANCE; OPTICAL-ABSORPTION; MNCL<sub>2</sub> FILLER; FILMS; POLYPARAPHENYLENE; POLYACETYLENE; SPECTROSCOPY

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## References

[1] Y. Takahashi

J. Polym. Sci., Polym. Phys., 35 (1997), p. 193

[2] A. Tawansi, H.M. Zidan, A.H. Oraby, M.E. Dorgham

J. Phys. D: Appl. Phys., 31 (1998), p. 3428

[3] J. Pacansky, S. Schneider

J. Phys. Chem., 94 (1990), p. 3166

[4] K. Yamaura, N. Kuranuki, H. Suzuki, T. Tanigami, S. Matsuzawa

J. Appl. Polym. Sci., 41 (1990), p. 2409

[5] M.J. Reimers, M.J. Cibulsky, T.A. Barbari

J. Polym. Sci., Polym. Phys., 31 (1993), p. 537

[6] R. Lei, X. Jie, X. Jun, Z. Ruiyum

J. Appl. Polym. Sci., 53 (1994), p. 325

[7] S.K. Mallapragad, N.A. Peppas

J. Polym. Sci., Polym. Phys., 34 (1996), p. 1339

[8] H.E. Assender, A.H. Windle

Polymer, 39 (1998), p. 4303

[9] Zainuddin, D.J.T. Hill, T.T. Le

Radiat. Phys. Chem., 62 (2001), p. 283

[10] V. Kuncser, G. Filoti, R. Podgorsek, M. Biebricher

J. Phys. D: Appl. Phys., 31 (1998), p. 2315

[11] A. Tawansi, H.M. Zidan, Y.M. Moustafa, A.H. Eldumiaty

Phys. Scr., 55 (1997), p. 243

- [12] M. Date, M. Motokawa  
J. Phys. Soc. Jpn., 24 (1968), p. 41
- [13] A. Tawansi, A.H. Oraby, H.M. Zidan, M.E. Dorgham  
Physica B, 254 (1998), p. 126
- [14] R.C.L. Mooney  
J. Am. Chem., 63 (1941), p. 2828
- [15] S. Kivelson  
Phys. Rev. B, 25 (1982), p. 3798
- [16] P. Kuivalainen, H. Stubb, H. Isotlo, P. Yli, C. Holmstrom  
Phys. Rev., 31 (1985), p. 7900
- [17] J.L. Bredas, R.R. Chance, R. Silbey  
Phys. Rev., 26 (1982), p. 5843
- [18] A. Tawansi, E.M. Abdel-razek, H.M. Zidan  
J. Mater. Sci., 32 (1997), p. 6243
- [19] A. Tawansi, A.H. Oraby, E.M. Abdelrazek, M.I. Ayad, M. Abdelaziz  
J. Appl. Polym. Sci., 70 (1998), p. 1437
- [20] D. Jiles  
Introduction to Magnetism and Magnetic Materials  
Chapman-Hall, London (1991)
- [21] D. Kivelson  
J. Chem. Phys., 33 (1960), p. 1094
- [22] T. Uhlich, M. Ulbricht, G. Tomaschewski, R. Stosser  
J. Appl. Polym. Sci., 58 (1995), p. 1587
- [23] J.L. Rao, A. Murali, E.D. Rao  
J. Non-Cryst. Solids, 202 (1996), p. 215
- [24] B. Hannoyer, M. Lenglet, J. Dürr, R. Cortes  
J. Non-Cryst. Solids, 151 (1992), p. 209
- [25] R.P.S. Chakradhar, A. Murali, J.L. Rao  
J. Mater. Sci., 35 (2000), p. 353

- [26] C.N. Banwell  
Fundamental of Molecular Spectroscopy  
Tata McGraw-Hill, New Delhi (1983) 301–307
- [27] R.J. Myers  
Molecular Magnetism and Magnetic Resonance Spectroscopy  
Prince-Hall, Englewood Cliffs, NJ (1973) pp. 202–203
- [28] F.J. Dyson  
Phys. Rev., 98 (1955), p. 349
- [29] G. Feher, A.F. Kip  
Phys. Rev., 98 (1955), p. 337
- [30] A. El-khodary, P. Bernier  
J. Chem. Phys., 85 (1986), p. 2243
- [31] F. Rachdi, P. Bernier, F. Schue  
J. Chem. Phys., 80 (1984), p. 625
- [32] A. Tawansi, A. El-Khodary, H.M. Zidan, S.I. Badr  
Polym. Testing, 21 (2002), p. 381
- [33] A.Tawansi, A. El-Khodary, A.E. Youssef, Int. J. Poly. Mater. 54 (4) (2005), in press
- [34] A. El-Khodary  
Physica B, 344 (2004), p. 297
- [35] T. Oguchi  
J. Phys. Soc. Jpn., 20 (1965), p. 2236
- [36] A.J. Van Duyneveldt, J. Soeteman, L.J. De Jongh  
J. Phys. Chem. Solids, 36 (1975), p. 481



## Effect of AgNO<sub>3</sub>-MnCl<sub>2</sub> mixed fillers on the physical properties of polystyrene films

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### Abstract:

This study deals with the effects of various filling levels of a mixture of two transition compounds [(X)AgNO<sub>3</sub>(10 - X)MnCl<sub>2</sub>] on the structural, electrical, and magnetic properties of atactic polystyrene (PS) films. X-ray diffraction (XRD) scans showed two main peaks for unfilled PS films. Crystalline peaks were unexpectedly detected with the filling and could be correlated to the formation of clusters. The IR transmission spectra revealed characteristic PS peaks. Certain IR peaks could be taken as evidence for the formation of polaron and bipolaron bound states in the polymeric matrix. The direct-current (DC) electrical conduction measurements suggested that the conduction mechanism could be attributed to phonon-assisted charge carrier hopping according to the inter-polaron hopping model. The DC magnetic susceptibility results at 90-235 K obeyed the Curie-Weiss law. The negative values of the paramagnetic Curie temperature ( $\theta(P)$ ) indicated the possibility of an antiferromagnetic exchange interaction, whereas the positive values of  $\theta(P)$  suggested a ferromagnetic exchange interaction at low temperatures. An electron spin resonance (ESR) spectrum at X = 0% revealed a broad Lorentzian signal. This suggested the presence of aggregated Mn<sup>2+</sup> and was confirmation of cluster formation found in XRD studies. On the other hand, ESR spectra at higher values of X depicted hyperfine structures characterized by the six unresolved lines of the manganese nucleus, indicating the existence of isolated Mn<sup>2+</sup>. (C) 2005 Wiley Periodicals, Inc. Accession Number: WOS:000226756400005

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## References

1. Marchal, E.; Benoit, H.; Vogl, O. *J Polym Sci Polym Phys Ed*1978, 16, 949.
2. Destruel, P.; Giam, H. T. *J Polym Sci Polym Phys Ed*1983, 21, 851.
3. Wang, L. W.; Porter, R. S. *J Polym Sci Polym Phys Ed*1983, 21, 907.
4. Henkee, C. S.; Kramer, E. J. *J Polym Sci Polym Phys Ed*1984, 22, 721.
5. Lucki, J.; Rabek, J. F.; Ranby, B.; Jiang, Y. C. *Polymer*1986, 27, 1193.
6. Sharma, A. K.; Adinarayana, V.; Sagar, D. S. *Polym Int*1991, 25, 167.
7. Tawansi, A.; Abdelkader, H. I.; Elzalabany, M.; Abdelrazek, E. M. *J Mater Sci*1994, 29, 3451.
8. Ünaleroglu, C.; Zümreoglu, B.; Özcan, S.; Firat, T. *J Appl Polym Sci*1995, 56, 1239.
9. Tawansi, A.; Oraby, A. H.; Zidan, H. M.; Dorgham, M. E. *Phys B*1998, 254, 126.
10. Tawansi, A.; Orabi, A. H.; Abdelrazek, E. M.; Ayad, M. I.; Abdelaziz, M. *J Appl Polym Sci*1998, 70, 1434.
11. Min, K. S.; Suh, M. P. *J Solid State Chem*2000, 152, 183. 1
12. Zhang, K.; Xu, Y.; Zheng, C.; Zhang, Y.; Wang, Z.; You, X. *Inorg Chim Acta*2001, 318, 61.
13. Ciurtin, D. M.; Smith, M. D.; Loye, H. C. *Solid State Sci*2002, 4, 461.
14. Tawansi, A.; El-Khodary, A.; Zidan, H. M.; Badr, S. I. *Polym Test*2002, 21, 381.
15. Zhu, L.; Liang, M.; Wang, Q.; Wang, W.; Liao, D.; Jiang, Z.; Yan, S.; Cheng, P. *J Mol Struct*2003, 657, 157.
16. Zidan, H. M. *J Appl Polym Sci*2003, 88, 104.
17. Tawansi, A.; Zidan, H. M.; Moustafa, Y. E.; El-Dumati, A. *Phys Scr*1997, 55, 243.
18. Dutta, R. L.; Syamal, A. *Elements of Magnetochemistry*; Chand: New Delhi, 1982; p 42.
19. Tager, A. *Physical Chemistry of Polymers*; Mir: Moscow, 1972.
20. Hammel, R.; Mackinght, W. J.; Karasz, F. E. *J Appl Phys*1975, 46, 10.
21. Ayyagari, C.; Bedrov, D.; Smith, G. D. *Macromolecules*2000, 33, 6194.
22. Vites, J. C.; Lynam, M. *Coord Chem Rev*1998, 172, 319.
23. Halicioglu, T.; Bauschlicher, C. W., Jr. *Rev Prog Phys*1988, 51, 883.

24. Geschwind, S. *Electron Paramagnetic Resonance*; Plenum: New York, 1972.
25. Youssef, A. E. M.S. Thesis, Mansoura University, 2003.
26. Silverstein, R. M.; Bassler, G. C.; Morrill, T. C. *Spectroscopic Identification of Organic Compounds*; Wiley: New York, 1973.
27. Kuivalainen, P.; Stubb, H.; Isotio, H. *Phys Rev B* 1985, 32, 7900.
28. Fincher, C. R.; Ozaki, M.; MacDiarmid, A. G. *Phys Rev B* 1979, 19, 4140.
29. Shacklette, L. W.; Chance, R. R.; Ivory, D. M.; Miller, G. G.; Baughman, R. H. *Synth Met* 1980, 1, 307.
30. Shacklette, L. W.; Eckhardt, H.; Chance, R. R.; Miller, G. G.; Ivory, D. M.; Baughman, R. H. *J Chem Phys* 1980, 73, 4098.
31. Racovics, D.; Bozovic, I.; Stepanyan, S. A.; Gribov, L. A. *Solid State Commun* 1982, 43, 127.
32. Bredas, J. L.; Chance, R. R.; Silbey, R. *Mol Cryst Liq Cryst* 1981, 77, 319.
33. Bredas, J. L.; Chance, R. R.; Silbey, R. *Phys Rev B* 1982, 26, 5843.
34. Kivelson, S. *Phys Rev B* 1982, 25, 3498.
35. Mott, N. F.; Gurey, R. W. *Electronic Process in Ionic Crystals*; Oxford University Press: London, 1940.
36. Myers, R. J. *Molecular Magnetism and Magnetic Resonance Spectroscopy*; Prince-Hall: Englewood Cliffs, NJ, 1973.
37. Jiles, D. *Introduction to Magnetism and Magnetic Materials*; Chapman & Hall: London, 1991.
38. Tawansi, A.; El-Khodary, A.; Youssef, A. E. *Int J Polym Mater*, to appear.
39. Luthra, V.; Singh, R.; Gupta, S. K.; Mansingh, A. *Curr Appl Phys* 2003, 3, 219.
40. Banwell, C. N. *Fundamentals of Molecular Spectroscopy*; Tata McGraw Hill: New Delhi, 1983; pp 301.
41. El-Khodary, A. *Physica B* 2004, 344, 297. 1