Filling effect on the structural, electrical, and magnetic properties of PVAc/Co composites

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Abstract

Polyvinyl-acetate/-cobalt (PVAc/Co) composite films were prepared using a casting technique. The structural and physical properties were studied using X-ray diffraction (XRD), differential scanning calorimetry (DSC), Fourier transform infrared (FTIR) spectroscopy, dielectric measurements, direct current magnetic susceptibility (?dc), and electron spin resonance (ESR). The XRD patterns revealed that the incorporation of Co particles increases the amorphization of PVAc and Co oxide formations. The DSC results suggest that the thermal properties obviously improved. Frequency and filler concentration dependence of the dielectric constant (e') and AC conductivity (sAC) were measured at room temperature in the frequency range 20 Hz to 3 MHz of pure PVAc and PVAc/Co composite films. The dielectric constant shows usual dielectric dispersion behavior. The dielectric constant and AC conductivity increased with the increase in Co content. The variation of sAC is attributed to hopping of polarons and bipolarons in the composites. The filling level dependence of the effective magnetic moment (mu eff) has been evaluated. The ESR spectra exhibit a peak of an increasing depth as Co content increases. The control of thermal stability, dielectric and magnetic moment of the composites films is interesting for applications such as electric and magnetic sensors. (C) 2012 Wiley Periodicals, Inc. J Appl Polym Sci, 2012

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Optical and dielectric properties of poly(vinylacetate)/lead oxide composites

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Abstract

Composite films of poly(vinylacetate)/red lead oxide have been prepared by mixing the fine lead oxide particles into polyvinylacetate solution under ultrasonication followed by film casting technique. Structural, optical and dielectric properties have been performed to characterize these composites films and compared their properties to pure PVAc film. The changes in the structural of the prepared films were investigated by X-ray diffraction (XRD) and FT-IR spectra. It has been observed that the crystallinity of the composites films depends on the Pb-content. Optical spectra of the composites films showed direct allowed band gaps lying in the range of 5.0-4.6 eV which is lower than that of PVAc. Frequency and doping level dependence of dielectric constant (epsilon'), ac conductivity (sigma(ac)) and tangent loss (tan delta) have been measured. The values of epsilon' were decreased with increasing in frequency, which indicates that the major contribution to the polarization comes from orientation polarization. The ac conductivity is more for doped PVAc than that of undoped PVAc. The experimental results show that epsilon' and sigma(ac) increase with adding of lead oxide in PVAc. The controllable of optical and dielectric properties of the composite film will draw much attention for potential applications.

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Cerium (III) doping effects on optical and thermal properties of PVA films

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Abstract

Cerium chloride (CeCl(3)) doped polyvinyl alcohol (PVA) films were prepared by casting technique. The effect of CeCl(3) concentrations on the structural, optical and thermal properties of the PVA films was studied by X-ray diffraction (XRD), FT-IR, UV-visible, transmittance (T), reflectance (R), differential scanning calorimetry (DSC) and thermogravimetry (TG). Both of the XRD and the DSC results affirm the increase in amorphousity. Absorption spectra of the doped films have shown an absorption band at 260 nm assigned to the trivalent state of cerium ions. Absorption, transmittance and reflectance spectra were used for the determination of the optical constants. The results indicate that the optical band gap (E(g)) was derived from Tauc's extrapolation and decreases with the cerium content. The refractive index increases with monotonic behavior as the cerium content increases. The dispersion of the refractive index is discussed in terms of the single-oscillator Wemple-DiDomernico model for obtaining the dispersion parameters. The obtained optical parameters were found to be strongly affected by CeCl(3) dopant. Thermal analysis showed that the thermal parameters of PVA are enhanced by CeCl(3). The dependence of the activation energy of the decomposition temperature on doping level was estimated.

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Influence of titanium chloride addition on the optical and dielectric properties of PVA films

Author(s): Abdelaziz, M (Abdelaziz, M.)[1,2] ; Ghannam, MM (Ghannam, Magdy M.)[3]
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Abstract

Polymeric films based on polyvinyl alcohol (PVA) doped with titanium chloride (TiCl(3)) at different weight percent ratios were prepared using the solvent cast technique. The structural properties of these polymeric films are examined by XRD and FTIR studies. The complexation of the clopant with the polymer was confirmed by FTIR studies. The XRD pattern reveals that the amorphous domains of PVA polymer matrix increased with raising the TiCl(3) content. The optical properties of these polymeric films were examined by optical absorption and emission spectroscopy. Electrical conductivity was measured at room temperature of pure PVA and PVA doped with different concentrations of TiCl(3) from 20 Hz to 3 MHz. The conductivity was found to increase with the increase in clopant concentration. The dielectric constant (epsilon') indicates a strong dielectric dispersion in the studied frequency range and increases as clopant content increases. This increase in both sigma and epsilon' is attributed to the increase in the localized charges distribution. Moreover, a loss peak was identified in the dielectric loss spectra and it is attributed to the orientation of polar groups.

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Electron spin resonance and optical studies of poly (methylmethacrylate) doped with CuCl2

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Abstract

Poly(methyl methacrylate) doped with CuCl2 was prepared and its electron spin resonance (ESR) spectra and optical properties were studied. The ESR spectra can be accounted for by the presence of two radicals: Ra and Rb. FTIR spectroscopy reveals that there is no main difference of the spectra due to the addition of CuCl2. The structural modifications are identified by investigating the doping level dependence of the peak heights of certain IR absorption peaks. The optical absorption, transmittance, and reflectance measurements were performed for prepared samples. The doping level (W) dependence on the g-factor (g), asymmetry factor (A), peak-to-peak separation (ΔHpp), spin concentration (N), optical energy gap (Eopt), Urbach energy (Eu), refractive index (n), average oscillator wavelength (λo), and average oscillator strength (So) were estimated. It was found that these parameters are changed with doping level. These changes suggest high sensitivity of these films to doping that would suggest the applicability in magnetic and/or optical devices. © 2008 Wiley Periodicals, Inc. J Appl Polym Sci, 2008

Keywords: PMMA; CuCl2; ESR; optical properties

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Source: MACROMOLECULES Volume: 30 Issue: 10 Pages: 2848-2852 DOI: 10.1021/ma961731f Published: MAY 19 1997

21.Title: [not available]
Author(s): TAUIHRI S
Source: POLYMER Volume: 43 Pages: 3123 Published: 2002

22.Title: Effect of CuCl2 and CoCl2 mixed fillers on the physical properties of polyvinylidene fluoride films
Author(s): Tawansi, A; Oraby, AH; Badr, SI; et al.
Source: JOURNAL OF MATERIALS SCIENCE-MATERIALS IN ELECTRONICS Volume: 14 Issue: 3 Pages: 135-141 DOI: 10.1023/A:1022397706252 Abstract Number: A2003-19-7865T-002; B2003-09-2810F-018 Published: MAR 2003

23.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

24.Title: Vibration and X-ray photoelectron spectroscopies of FeCl3-doped poly(p-diethynylbenzene)
Author(s): Zhan, XW; Xu, SG; Yang, MJ; et al.
Source: EUROPEAN POLYMER JOURNAL Volume: 38 Issue: 10 Pages: 2057-2061 Article Number: PII S0014-3057(02)00091-5 DOI: 10.1016/S0014-3057(02)00091-5 Published: OCT 2002

25.Title: Miscibility, optical and dielectric properties of UV-irradiated poly(vinylacetate)/poly(methylmethacrylate) blends
Author(s): Zidan, HM; Tawansi, A; Abu-Elnader, M
Source: PHYSICA B-CONDENSED MATTER Volume: 339 Issue: 2-3 Pages: 78-86 DOI: 10.1016/j.physb.2003.08.054 Abstract Number: A2004-10-7865T-004; B2004-05-4110-051 Published: DEC 1 2003

Effect of dopant mixture on structural, optical and electron spin resonance properties of polyvinyl alcohol

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Physica B 390 (2007) 1–9

Abstract

Pure polyvinyl alcohol (PVA) and PVA/(x)AgNO3(15x)MnCl2 films, where x ¼ 0:0%, 1%, 5%, 7.5%, 10%, 14% and 15%, were prepared by casting technique. The prepared films were studied by differential thermal analysis, X-ray diffraction (XRD), spectral (UV–Vis–IR spectroscopy), DC conductivity and electron spin resonance (ESR). Thermal stability of the prepared films was decreased for doped films. XRD and spectral studies revealed that the structural and chemical characterizations of PVA are strongly affected by mixed fillers. The electric conduction data were interpreted on the basis of an intrachain one-dimensional interpolaron hopping model. The calculated values of the charge carriers hopping distance were in the range 2–6 nm. ESR spectra revealed that (i) aggregated forms of Mn2+ ions were formed at higher concentration and isolated forms at lower concentration and (ii) silver clusters were formed at x ¼ 15 wt%. The filling level dependence of ESR parameters was discussed. r 2006 Published by Elsevier B.V. PACS: 61.P; 42.70.J; 78.30.J; 72.50.P

Keywords: Polyvinyl alcohol; Transition metals; DTA; XRD; Spectral analysis; DC conductivity; ESR

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Effect of dopant mixture on structural, optical and electron spin resonance properties of polyvinyl alcohol

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Abstract

Pure polyvinyl alcohol (PVA) and PVA/(x)AgNO3(15-x)MnCl2 films, where x = 0.0%, 1%, 5%, 7.5%, 10%, 14% and 15%, were prepared by casting technique. The prepared films were studied by differential thermal analysis, X-ray diffraction (XRD), spectral (UV-Vis-IR spectroscopy), DC conductivity and electron spin resonance (ESR). Thermal stability of the prepared films was decreased for doped films. XRD and spectral studies revealed that the structural and chemical characterizations of PVA are strongly affected by mixed fillers. The electric conduction data were interpreted on the basis of an intrachain one-dimensional interpolaron hopping model. The calculated values of the charge carriers hopping distance were in the range 2-6 nm. ESR spectra revealed that (i) aggregated forms of Mn2+ ions were formed at higher concentration and isolated forms at lower concentration and (ii) silver clusters were formed at x = 15wt%. The filling level dependence of ESR parameters was discussed. (c) 2006 Published by Elsevier B.V.

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Figure 13 Temperature dependency of the hopping distances for various filling levels (in wt %): (a) curve 1: 0.0; curve 2: 1; curve 3: 5; (b) curve 4: 7.5; curve 5: 10; curve 6: 14; curve 7: 15.

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Characterization, electrical and magnetic properties of PVDF films filled with FeCl3 and MnCl2 mixed fillers

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Abstract

Polyvinylidene fluoride (PVDF)/(x) FeCl3 (20x) MnCl2 films, where x=0.0%, 1%, 5%, 10%, 15%, 19%, and 20%,

were prepared by the casting technique. Their thermal and crystalline structure, electric and magnetic properties, and

ESR were examined. For thermal measurements, with increasing FeCl3 content, the melting temperature rarely changed

while the thermal degradation temperature decreased. X-ray diffraction and infrared analysis show that the crystalline

structure of PVDF changed drastically on addition of FeCl3, indicating that there are interactions between the PVDF

matrix and FeCl3 and MnCl2. The optical and electrical measurements revealed a nearly monotonic behavior of optical

gapand electrical resistivity as FeCl3 content increased. The direct current (DC) magnetic susceptibility indicates a

predominantly ferromagnetic interaction between the magnetic ions at lower temperatures for all samples. The ESR

spectra indicate the aggregated forms of Fe3+ and Mn2+ ions that confirm the results obtained from optical

measurements and DC magnetic susceptibility.

PACS: 71.20.R; 72.80.L; 75.50.P

Keywords: Polyvinylidene fluoride; FeCl3–MnCl2 mixed fillers; Optical spectra; DC electric conduction; DC magnetic susceptibility

and ESR

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