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The impact of film thickness on the properties of ZnO/PVA nanocomposite film

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Abstract

Polymer inorganic nanocomposites are attracting a considerable amount of interest due to their enhanced electrical and optical properties. The inclusion of inorganic nanoparticles into the polymer matrix results in a significant change in the nanocomposite's properties. With this in mind, we have developed a nanocomposite film based on zinc oxide (ZnO) and polyvinyl alcohol (PVA) using a solution casting method with varying concentrations of ZnO nano powder in the PVA matrix. The ZnO / PVA film surface morphology was observed by the scanning electron microscope (SEM). The micrographs indicate that ZnO nanoparticles in the PVA matrix are homogeneously distributed. XRD results indicated that the crystallinity of the film was influenced by the interaction of ZnO nanoparticles and the PVA main chain. Crystallinity is also affected by the doping of ZnO nanoparticles in the PVA matrix and it increases when the concentration of ZnO is low and then decreases when the excess concentration of ZnO is present in the PVA matrix. The FTIR transmission spectra confirmed that significant interaction took place between the ZnO nanoparticles and the PVA main chain over the wave number range of 400-4000 cm⁻¹. The UV-vis spectra reveal that the increase in concentration of ZnO nanoparticles in the polymer matrix results in the movement of the absorption edge in the direction of higher wavelength or lower energy associated with the blue/green portion of the visible spectrum. A decrease in the optical energy bandgap is observed with the increase in nano ZnO concentration in the

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matrix. Thickness has a significant affect on the properties of the ZnO/PVA nanocomposite and the morphology, particle size, degree of crystallinity and bandgap of the ZnO/PVA nanocomposite samples were influenced by the thickness of the sample. The optimal thickness of 0.03 mm with a weight percentage of 16.6% (ZnO) and 83.3% (PVA matrix) was selected due to its higher bandgap of 4.22 eV, reduced agglomeration/aggregation and smaller ZnO particle size of 14.23 nm in the matrix. The optimal film can be used in photovoltaic research.

Keywords

Author Keywords: ZnO; PVA nanocomposite; solution casting ; low temperature processing; thickness of ZnO; PVA nanocomposite film

Keywords Plus: PVA

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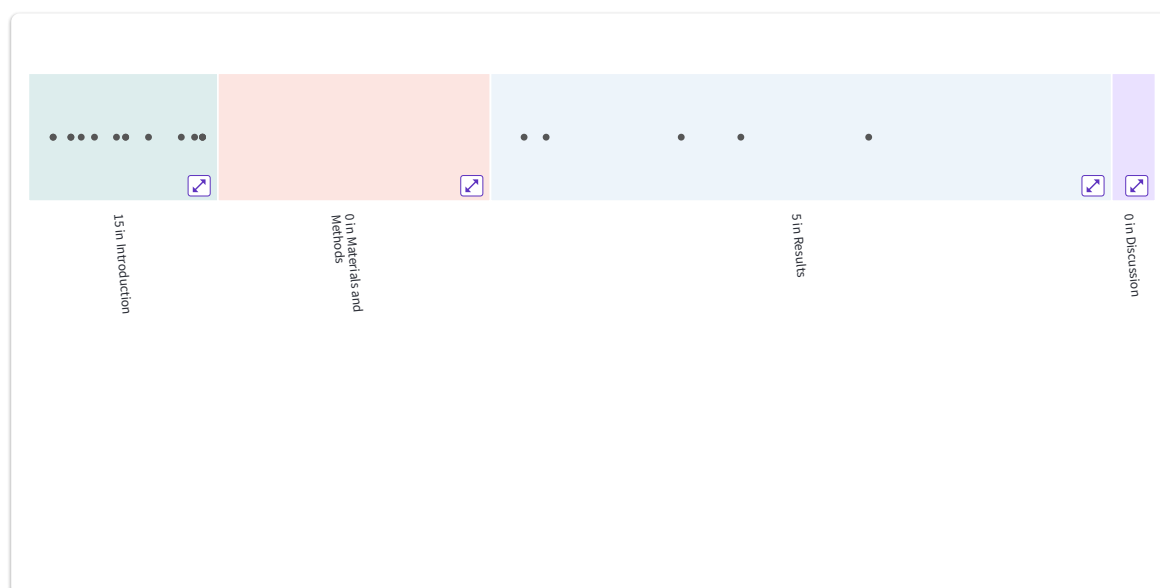
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Jan 2020 | [Materials Research Express](#)

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31

References

[Related records](#)

- 2 **Efficiency of thin film photovoltaic paint: A brief review**

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2019 | International Journal Of Recent Engineering And Technology
URL: <https://www.ijrte.org/wp-content/uploads/papers/v7i6s/F02330376S19.pdf>

Cited in Article: 1

2

Citations

0

References

- 3 **Evaluation of the Influence of Modified TiO₂ Particles on Polypropylene Composites**

[Soares, IL](#); [Chimanowsky, JP](#); (...); [Tavares, MIB](#)
Aug 2015 | Journal Of Nanoscience And Nanotechnology

[Full Text at Publisher](#) ...

Cited in Article: 1

12

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31

References

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	<p>Rahman, Ataur.; Khan, ShaheerAhmed. and Aung, KawMyo. 2020 Test Engineering And Management URL: http://testmagzine.biz/index.php/testmagzine/article/view/3231/2854</p> <p>Cited in Article: 1</p>	<p>0 References</p>
5	<p>Physics of ZnO/SiO₂ electrolyte semi-conductive thermal electric generator Rahman, A; Aung, KM; (...); Rahman, M May 2017 International Journal Of Advanced And Applied Sciences Free Full Text from Publisher ...</p> <p>Cited in Article: 1</p>	<p>1 Citation</p> <p>20 References</p> <p>Related records</p>
6	<p>Hybrid Organic/Inorganic Nanocomposites for Photovoltaic Cells Liu, RC Apr 2014 Materials Free Full Text from Publisher ...</p> <p>Cited in Article: 1</p>	<p>97 Citations</p> <p>178 References</p> <p>Related records</p>
7	<p>Investigation of energy band gap in polymer/ZnO nanocomposites Shanshool, HM; Yahaya, M; (...); Abdullah, IY Sep 2016 Journal Of Materials Science-materials In Electronics Full Text at Publisher ...</p> <p>Cited in Article: 1</p>	<p>29 Citations</p> <p>39 References</p> <p>Related records</p>
8	<p>PVA, PVA Blends, and Their Nanocomposites for Biodegradable Packaging Application Abdullah, ZW; Dong, Y; (...); Barbhuiya, S 2017 Polymer-plastics Technology And Engineering Full Text at Publisher ...</p> <p>Cited in Article: 1</p>	<p>52 Citations</p> <p>200 References</p> <p>Related records</p>
9	<p>Grafted SiC nanocrystals: For enhanced optical, electrical and mechanical properties of polyvinyl alcohol Saini, J; Sharma, A; (...); Sharma, PK Aug 15 2017 Journal Of Alloys And Compounds Full Text at Publisher ...</p> <p>Cited in Article: 1</p>	<p>17 Citations</p> <p>56 References</p> <p>Related records</p>
10	<p>[Not available] Verma, R.</p>	<p>1 Citation</p>

2018 | Design, Fabrication And Characterization Of Pva/nanocarbon Composite Fibers Arizona State University (Order No. 10981635)
URL: <http://210.48.222.80/proxy.pac/docview/2154886070?accountid=44024>

0
References

Cited in Article: 1

11 [Chemical Modification of Poly\(Vinyl Alcohol\) in Water](#)

[Awada, H](#) and [Daneault, C](#)
Dec 2015 | Applied Sciences-basel

[Free Full Text from Publisher](#) ...

Cited in Article: 1

59
Citations

25
References

[Related records](#)

12 [Fundamentals, Properties, and Applications of Polymer Nanocomposites](#)

[Koo, JH](#)
2016 | Fundamentals, Properties, And Applications Of Polymer Nanocomposites

...

Cited in Article: 1

22
Citations

0
References

13 [Synthesis, characterization and optical properties of hybrid PVA-ZnO nanocomposite: A composition dependent study](#)

[Hemalatha, KS](#); [Rukmani, K](#); (...); [Nagabhushana, BM](#)
Mar 2014 | Materials Research Bulletin

[Full Text at Publisher](#) ...

Cited in Article: 1

98
Citations

60
References

[Related records](#)

14 [Improvement Optical Properties of PVA/ TiO₂ and PVA/ ZnO Nanocomposites](#)

[Mohammed, N.](#); [Hassan, A.](#) and [Rasheed, Z.](#)
2019 | Al-mustansiriyah Journal Of Science

[View full text](#)

Cited in Article: 1

2
Citations

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References

15 [Energy storage Al-ZnO/CuO_CFRP organic structural auxiliary energy storage system for electric vehicle](#)

[Rahman, Aatur.](#) and [Kibria, Golam.](#)
2021 | Solid State Science And Technology
URL: <http://myjms.mohe.gov.my/index.php/masshp/article/view/10739>

Cited in Article: 1

1
Citation

0
References

- 16 Advancement in Microstructural, Optical, and Mechanical Properties of PVA (Mowiol 10-98) Doped by ZnO Nanoparticles (From: Inspec®)
[Rithin Kumar, N.B.](#); [Crasta, V.](#) and [Praveen, B.M.](#)
2014 | Physics Research International
[Free Full Text From Publisher](#) ...
Cited in Article: 1
- 9 Citations
0 References
- 17 Concentration-dependent behaviors of ZnO-reinforced PVA-ZnO nanocomposites as electron transport materials for OLED application
[Kandulna, R](#) and [Choudhary, RB](#)
Jul 2018 | Polymer Bulletin
[View full text](#) ...
Cited in Article: 1
- 17 Citations
57 References
[Related records](#)
- 18 Polymeric Nanocomposites Membranes with High Permittivity Based on PVA-ZnO Nanoparticles for Potential Applications in Flexible Electronics
[Ambrosio, R](#); [Carrillo, A](#); (...); [Vivaldo, I](#)
Dec 2018 | Polymers
[Free Full Text from Publisher](#) ...
Cited in Article: 1
- 36 Citations
42 References
[Related records](#)
- 19 Zinc oxide encapsulated poly (vinyl alcohol) nanocomposite films as an efficient third-order nonlinear optical material: Structure, microstructure, emission and intense low threshold optical limiting properties
[Viswanath, V](#); [Nair, SS](#); (...); [Muneera, CI](#)
Apr 2019 | Materials Research Bulletin
[Full Text at Publisher](#) ...
Cited in Article: 1
- 11 Citations
72 References
[Related records](#)
- 20 Synthesis and characterization of ZnO, CuO and a mixed Zn and Cu oxide
[Fernandes, DM](#); [Silva, R](#); (...); [Pineda, EAG](#)
May 15 2009 | Materials Chemistry And Physics
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Cited in Article: 1
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