The research of how the viewing behavior of fighting and adventurous cartoons impact on junior high school students' bul

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ABSTRACT

Conjugated polymers are one of the important organic semiconductors material, which were used for light emitting diodes, photovoltaic cells, filed emission transfer, thin film transistor, etc. The polymer photovoltaic cells attracted much attention due to their possibilities of low-cost, light, flexible and easy manufacturing by solution process in recent years. Thus, a novel series of low regioregularity P3HTs and alternatively H-H, T-T poly(bithiophene) were synthesized by oxidative polymerization. The produced polymers were then added bromine group into the 4-position of thiophene rings, so that we can utilized the intramolecular coupling to cyclization between two neighboring thiphene rings. To identify structure nuclear magnetic resonance (NMR) and Fourier transform infrared spectroscopy (FT-IR) were used, physical properties via MALDI/TOF-TOF (TOF), thermal stability properties via thermogravimetrci analysis (TGA) and differential scanning calorimetry analysis (DSC). Optical properties were measured by UV-visible absorption (UV-vis), fluorescence (PL), and photo-electron spectroscopy in air (PESA) spectra.

Keywords : thiophene、P3HT、bromoziation

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REFERENCES

1. Kevin M. Coakley and Michael D. McGehee, “ Conjugated Polymer Photovoltaic Cells ”, Chem. Mater., 16, 4533 (2004). 2. Adam P. Smith, Rachel R. Smith, Barney E. Taylor, and Michael F. Durstock, “ An Investigation of Poly(thienylene vinylene) in Organic Photovoltaic Devices ”, Chem. Mater., 16, 4687 (2004) . 3. Shuxin Tan, Jin Zhai, Meixiang Wan, Qingbo Meng, Yuliang Li, Lei Jiang, and Daoben Zhu, “ Influence of Small Molecules in Conducting Polyaniline on the Photovoltaic Properties of Solid-State Dye-Sensitized Solar Cells ”, J. Phys. Chem. B, 108, 18693 (2004) . 4. Zhan ’ ao Tan, Jianhui Hou, Youjun He, Erjun Zhou, Chunhe Yang, and Yongfang Li, “ Synthesis and Photovoltaic Properties of a Donor?Acceptor Double-Cable Polythiophene with High Content of C60 Pendant ”, Macromolecules, 40, 1868 (2007) . 5.張正華, 李陵嵐, 葉楚平, 楊平華, 馬振基, “ 有機與塑膠太陽能電池 ” (2007) . 6. Holger Spanggaard, Frederik C. Krebs, “ A brief history of the development of organic and polymeric photovoltaics ”, Solar Energy Materials & Solar Cells, 83, 125 (2004) . 7. Nelson, J., Phys. Rev. B., 67, 155209 (2002). 8. H. Antoniadis, B.R. Hsieh, M.A Abkowitz, S.A. Jenekhe, M. Stolka, Photovoltaic and photoconductive properties of aluminum/poly(p-phenylene vinylene) interfaces, Synth. Met., 62, 265 (1994) . 9. G. Yu, C. Zhang, A.J. Heeger, Appl. Phys. Lett., 64, 1540 (1994) . 10.R.N. Marks, J.J.M. Halls, D.D.C. Bradley, R.H. Friend, A.B. Holmes, “ The photovoltaic response in poly(p-phenylene vinylene) thin-film devices ”, J. Phys. Condens. Matter, 6, 1379 (1994) . 11.C.J. Brabec, A. Cravino, D. Meissner, N.S. Sariciftci, M.T. Rispens, L. Sanchez, J.C. Hummelen, T. Fromherz, “ The influence of materials work function on the open circuit voltage of plastic solar cells ”, Thin Solid Films, 403,368 (2002) . 12. Adam P. Smith, Rachel R. Smith, Barney E. Taylor, and Michael F. Durstock, “ An Investigation of Poly(thienylene vinylene) in Organic Photovoltaic Devices ”, Chem. Mater., 16, 4687 (2004) . 13. H. Shirakawa, E.J. Louis, A.G. MacDiramid, C.K. Chiang, A.J. Heeger, J. Chem. Soc., Chem. Commun., 578 (1977) . 14. H. Shirakawa, “ The Discovery of Polyacetylene Film: The Dawning of an Era of Conducting Polymers (Nobel Lecture) ”,

Angew. Chem. Int. Engl., 40, 2574 (2001) . 15. A. G. MacDirmid, Synthetic Metals : A Novel Role for Organic Polymers (Nobel Lecture) ”, Angew. Chem. Int. Ed. Engl., 40, 2581 (2001). 16. A. J. Heeger, “ Semiconducting and Metallic Polymers: The Fourth Generation of Polymeric Materials (Nobel Lecture) ”, Angew. Chem. Int. Ed. Engl., 40, 2591 (2001). 17. G. Tourillon, in Handbook of conducting of Polymer, T. A. Stothemim, Ed. Marcel Dekker, New York, 294 (1986). 18. A. F. Diaz, K. K. Kanazawa, G. P. Gardini, J. Chem. Soc.. Chem. Commun., 635 (1979) . 19. J. G. Burroughes, D. D. C. Bradley, A. R. Brown, R. N. Marks, K. MacKay, R. H. Friend, P. L. Burns and A. B. Holmes, Nature, 247, 539 (1990) . 20. (a) K. Y. Jen, R. Oboodi, R. L. Elsenbaumer, Polym. Mater. Sci. Eng.m 53, 79 (1985) . (b) R. L. Elsenbaumer, K. Y. Jen, R. Oboodi, “ Processible and environmentally stable conducting polymers ”, Synth. Met., 15, 169 (1986). 21. G. G. Miller, R. L. Elsenbaumer, J. Chem. Soc., Chem. Commun. 1346 (1986). 22. J. J. M. Halls and R. H. Frien, in Clean electricity from photovoltaic, edited by M. D. Archer and R. Hill(Imperial College Press, London) 377 (2001) 23. (a) C. D. Dimitrakopoulos, D. J. Mascaro, “ Organic Thin Film Transistors for Large Area Electronics ”, Adv. Mater. 14, 99 (2002) (b) F. Garnier, R. Hajlaoui, A. Yassar, P. Srivastava, “ All-Polymer Field-Effect Transistor Realized by Printing Techniques ”, Science, 265, 1684 (1994) . (c) Z. Bao, “ Materials and Fabrication Needs for Low-Cost Organic Transistor Circuits ”, Adv. Mater., 12, 227 (2000) . (d) G. H. Gelinck, T. C. T. Geuns, D. M. De Leeuw, Appl. Phys. Lett., 77, 1487 (2000) . (e) H. E. A. Huitena, G. H. Gelinck, J. B. P. H. van der Putter, K. E. Kuijk, C. M. Hart, E. Cantatore, P. T. Herwig, A. J. J. M. van Breemen, D. M. de Leeuw, Nature, 414, 599 (2001) . (f) B. S. Ong, Y. Wu, P. Liu, S. Gardner, J. Am. Chem. Soc., 126, 3378 (2004). 24. L. Akcelrud, Prog. Polym. Sci., 28, 875 (2003). (b) R. H. Friend, R. W. Gymer, A. B. Holmes, J. H. Burroughes, R. N. Marks, C. Taliani, D. D. C. Bradley, D. A. dos Santos, J. L. Bredas, M. Loglund, W. r. Salaneck, Nature, 397, 121, (1999). (c) A. Kraft, A. Grimsdale, A. B. Holmes, Angew. Chem. Int., 37, 402 (1998). (d) J. R. Sheats, Y. L. Chang, D. B. Roitman, A. Socking, Acc. Chem. Res., 32, 193 (1999). (d) S. Miyata H. S. Nalwa, in Organic electroluminescent materials and devices. Amsterdam: Gordon & Breach (1997). (e) X. Gong, J. C. Ostrowski, M. R. Robinson, D. Moses, G. C. Bazan, A. J. Heeger, Adv. Mater., 14, 581 (2002). (f) R. H. Partridge, Polymer, 24, 733 (1983). 25. (a) J. Christoph, J. Brabec, N. S. Sariciftci, J. C. Hummelen, Adv. Funct. Mater., 11, 15 (2001). (b) J. Xue, S. Uchida, B. P. Rand, S. R. Forrest, Appl. Phys. Lett., 84, 3013 (2004). (c) N. S. Sariciftci, L. Smilowitz, A. J. Heeger, F. Wudl, Science, 258, 1474 (1992). (d) S. Morita, A. A. Zakhidov, K. Yoshino, Solid State Commun., 82, 249 (1992). 26. Yuning Li, George Vamvounis, Steven Holdcroft, “ Facile Functionalization of Poly(3-alkylthiophene)s via Electrophilic Substitution ”, Macromolecules, 34, 141 (2001) 27. Kenneth J. Hoffmann, Eivind Bakken, Emil J. Samuelsen , Per H.J. Carlsen, “ Synthesis and polymerization of 3,3 ’-dialkyl-2,2 ’-bithiophenes Synthetic Metals ”, 113, 39(2000). 28. 黃北辰, 高雄應用科技大學化學工程與材料工程所碩士論文, (2007). 29. 李易展, 高雄應用科技大學化學工程與材料工程所碩士論文, (2008). 30. 籃鉦欣, 高雄應用科技大學化學工程與材料工程所碩士論文, (2009).