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LITERATURE SURVEY OF ADVANCE MADE IN TRANSPARENT ELECTRONICS

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Abstract—Transparent electronics is an promising science and technology field focused on manufacturing 'invisible' electronic circuitry and opto-electronic devices. Example, automobile windshields could transmit visual information to the driver. Glass can be used as a electronic device, possibly improving security systems or offering transparent displays. In a similar way, windows can be used to produce electrical power. Other civilian and military applications in this research field include real time wearable displays.

Key words: electronics, invisible, transparent

Introduction

The first scientific objective of this technology must be to discover, understand, and implement transparent electronics to real time applications. The second goal is their execution and evaluation in transistor and circuit structures. The third goal relates to achieving application-specific properties. The transistor performance and materials characteristics will vary, depending on the final product device specifications. As a result, to enable this innovative technology requires bringing together expertise from various applied sciences, including materials science, chemistry, physics, electrical/electronic/circuit engineering, and display science.

- In Transparent electronics are opaque semiconductor materials forming the basis for electronic device fabrication is replaced with Transparent materials.
- Transparent electronics is an emerging technology that consist of wide band-gap semiconductors for the realization of invisible electronics circuits .

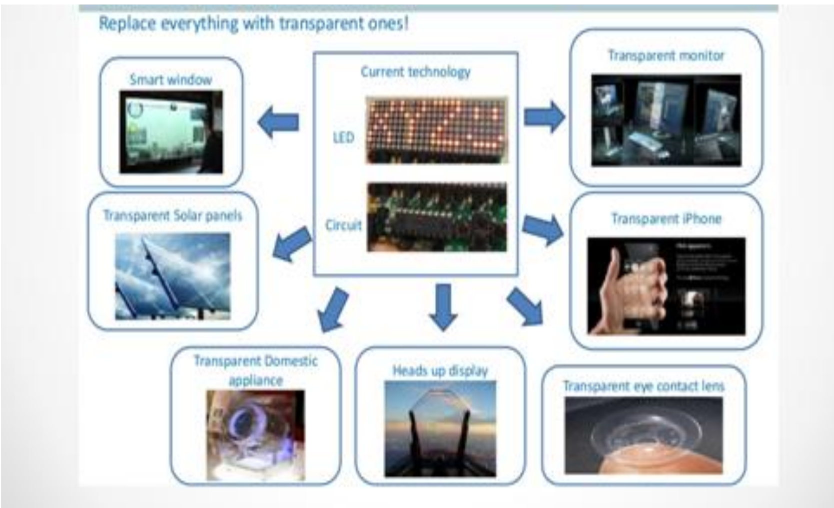

Fig 1 application of transparent electronics

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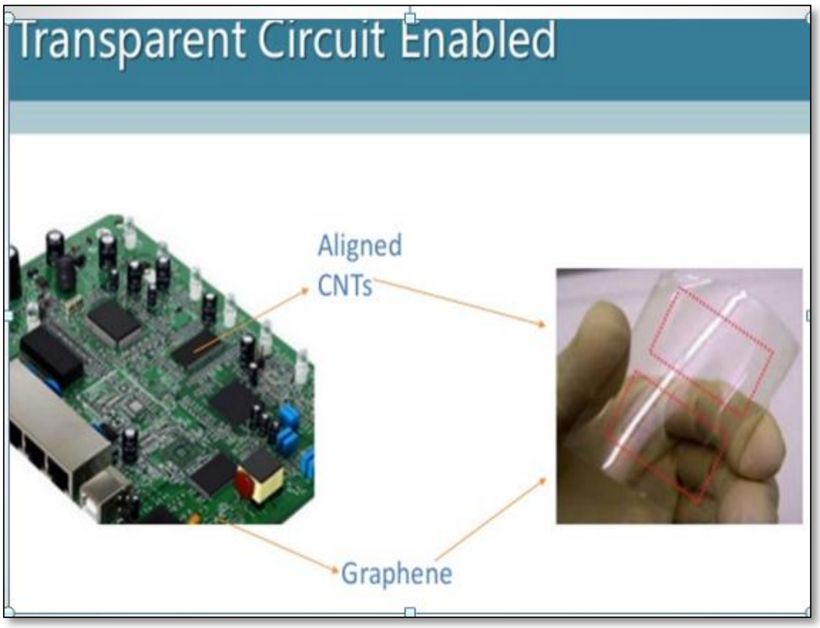

Fig2 Realization of Transparent electronics

Fumiaki N. Ishikawa et al. [1] have been made-up a fully transparent thin-film transistor on inflexible as well as on flexible substrate by using low temperature processing. The low temperature processing enable the device fabrication on a flexible substrate. They used nano tubes as a channel and indium-tin-oxide as a drain, source and gate electrodes. YanfeXu et al. [2] have been produced transparent, conductive grapheme films by using spin-coating method. By means of this grapheme films they fabricated a bulk heterojunction polymer organic photovoltaic device. As the grapheme solution is used to fabricate grapheme film for electrodes the process becomes cost efficient and simple. The films can be used as electrode in polymer OPVs by replacing ITO electrodes. J.F. Wager [3] has reviewed and gave a information about the interface formation theory. This theory is applied to the problem of indium tin oxide (ITO) – zinc oxide and ITO – tin oxide interfaces for source-drain contacts in transparent thin-film transistors. The ideal interface originates from Fermi level mediated charge transfer giving rise to a macroscopic interfacial dipole. As the battery electrodes are not transparent and have to be thick to store energy they are not suitable for transparent devices. Yuan Yang et al. [4] demonstrated a grid-structured electrode to solve this problem. They fabricated this electrode by using micro fluidics-assisted method. The fabricated electrode is below the resolution limit of human eyes, and, thus, the electrode appears transparent. Chanda Krishna (5) explained about the principle of conventional transparent conductors.

Optically transparent and mechanically flexible circuitries have long been desired for next-generation electronics requiring unprecedented features, such as “see-through” visibility, deformability, and even skin-attachable functionality for health care systems (5-8). This new pattern for electronic applications has provoked researchers to keenly pursue new inventive semiconducting materials, the class of resources called semiconducting conjugated polymers (4). Their unique benefits, together with mechanical flexibility, light weight, and processing advantages based on high-throughput fabrication processes using solution-printing technologies, have accelerated the development of these materials as key in building blocks for next-generation ubiquitous systems (9,10). Nevertheless, these materials still cannot fulfill the ultimate requirements for future “flexible” and “transparent” electronics (FTEs). Together with their inferior charge-carrier mobility because of conformational and energetic disorder (11), their high light absorption in the visible range, which is inherent to this class of

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materials (absorption coefficient ∼105 cm−1) (12), makes it difficult to apply these materials in FTEs. Indeed, despite widespread investigations looking for a appropriate model system for FTEs by unreliable the polymer-structure design and the processing techniques used, the concurrent attainment of optical transparency and elevated mobility in semiconducting polymers remains a formidable challenge (13).

Among the a variety of types of semiconducting polymers, low-bandgap polymers by the donor–acceptor (D-A) copolymerization scheme are promising candidate materials for FTE applications. These semiconducting copolymers exhibit much less absorption in the visible variety compared with other typical middle bandgap polymers because of their red-shifted π–π* absorption spectrum, which exhibits strong absorption in the near-infrared (IR) region (11). Several D-A copolymers have recently been found to show exceptionally high mobility (exceeding 1 cm2 V−1·s−1), despite their relatively low crystalline order (14). However, because of their high optical density, even for ultrathin films (thickness $t < 100$ nm), it remains difficult to obtain fully transparent and colorless thin films using copolymers of this type. Moreover, obtaining high mobility typically requires undesirable processing techniques, such as high-temperature annealing (15) and macroscopic alignment processes (16), which are not readily compatible with flexible electronics. Therefore, the realization of truly colorless semiconducting layers with high mobility for FTEs remains to be achieved.

Multicomponent systems consisting of a variety of polymer blends have recently paying attention particular attention because of the tunability of material properties (16). Current reports have shown that blends containing a comparatively little quantity of semiconducting polymer in an inert polymer matrix exhibit charge-transport characteristics that are analogous or even superior to those of the perfect forms. However, a comprehensive understanding of the underlying mechanism of this intriguing phenomenon has not yet been achieved. We note that this polymer-blending approach can provide new opportunities for the development of innovative polymer systems for FTEs. Here, by introducing a diketopyrrolopyrrole (DPP)-based semiconducting copolymer (DPP2T) into an inert polystyrene (PS) matrix, we create a polymer blend system that demonstrates both high mobility and high transparency approaching 100% without developing any color. We discover that a small amount of DPP2T in an amorphous PS matrix forms a web-like, continuously connected nanonetwork that spreads throughout the thin film formed during solution deposition while remaining confined in a thin fibrous structure. Detailed study reveals that this network structure of DPP2T provides highly efficient charge pathways with substantially reduced structural and energetic disorder through its extended intrachain conjugation. This approach therefore enables us to fabricate prototype high-performance FTE devices.

CONCLUSION

This appealing class of devices will have the great spontaneous impact on the interface between human and the machines in the by future. As the world is suffering from climate change which is the result of pollution, the transparent electronics is one of the best technologies which give the best solution as OLEDs which in the presence of oxygen breaks down without damaging the environment.

REFERENCES

1. Fumiaki N. Ishikawa, Hsiao-kang Chang, KoungminRyu, Po-chiang Chen, Alexander Badmaev, Lewis Gomez De Arco, Guozhen Shen, and Chongwu Zhou, “Transparent

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Electronics Based on Transfer Printed AlignedCarbon Nanotubes on Rigid and Flexible Substrates", ACS Nano Article, pp 73–79, 2009.

2. Yanfei Xu, Guankui Long, Lu Huang, Yi Huang, Xiangjian Wan, Yanfeng Ma, Yongsheng Chen, "Polymer photovoltaic devices with transparent grapheme electrodes produced by spin-casting", Carbon48, pp. 3308-3310, 2010.

3. J.F. Wager, "Transparent electronics: Schottky barrier and hetero-junction considerations", Thin Solid Films, Elsevier Science, pp. 1755-1764, 2008

4. Yuan Yanga, Sangmoo Jeongb, Liangbing Hu, Hui Wua, Seok Woo Lee, and Yi Cui, "Transparent lithium-ion batteries", PNAS, Vol. 108 No. 32, pp. 13013-13018, 2011

5. Rogers J, Someya T, Huang Y (2010) Materials and mechanics for stretchable electronics.Science 327(5973):1603–1607.

6. Forrest SR, (2004) The path to ubiquitous and low-cost organic electronic appliances on plastic.Nature 428(6986):911–918.

7. Xu S, et al. (2014) Soft microfluidic assemblies of sensors, circuits, and radios for the skin.Science 344(6179):70–74.

8. Arias AC, MacKenzie JD, McCulloch I, Rivnay J, Salleo A (2010) Materials and applications for large area electronics: Solution-based approaches. Chem Rev 110(1):3–24.

9. Yan H, et al. (2009) A high-mobility electron-transporting polymer for printed transistors. Nature457(7230):679–686.

10.Berggren M, Nilsson D, Robinson ND (2007) Organic materials for printed electronics. Nat Mater6(1):3–5.

11. Noriega R, et al. (2013) A general relationship between disorder, aggregation and charge transport in conjugated polymers. Nat Mater 12(11):1038–1044.

12. Sakalakos L (2010) Nanotechnology for Photovoltaics (CRC Press, Boca Raton, FL), p 170.

13. Sirringhaus H (2014) 25th anniversary article: Organic field-effect transistors: The path beyond amorphous silicon. Adv Mater 26(9):1319–1335.

14. Di CA, Zhang F Zhu D, (2013) Multi-functional integration of organic field-effect transistors (OFETS): Advances and perspectives. Adv Mater 25(3):313–330.

15. Dou L, Liu Y, Hong Z, Li G, Yang Y (2015) Low-bandgap near-IR conjugated polymers/molecules for organic electronics. Chem Rev 115(23):12633–12665.

16. Nielsen CB, Turbiez M, McCulloch I (2013) Recent advances in the development of semiconducting DPP-containing polymers for transistor applications. Adv Mater 25(13):1859–1880.