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Areas of Research: Quantum-Dot Solar Cells

A. PROFESSIONAL PREPARATION

University of Michigan, Physics, Ph.D., 1979
University of Michigan, Physics, M.S., 1974
University of California, Berkeley, Physics, B.S., 1972

B. APPOINTMENTS

Professor and Vice President for Research University of Michigan 2006-present
Chartered Semiconductor Manufacturing Chair, EE Department, National University of Singapore 2005-present
James S. McDonnell Distinguished University Professor, EE Department, Princeton Univ. 1992-2006
Chairman, EE Department, Princeton Univ. 1997-2001
Director, Center for Photonic and Optoelectronic Materials, Princeton Univ. 1992-1997

C. SYNERGISTIC ACTIVITIES

First at Bell Labs, he investigated photodetectors for optical communications. In 1985, Prof. Forrest joined the Electrical Engineering and Materials Science Departments at USC where he worked on opto-electronic integrated circuits, and organic semiconductors. In 1992, Prof. Forrest became the James S. McDonnell Distinguished University Professor of Electrical Engineering at Princeton University. He served as director of the National Center for Integrated Photonic Techology, and as Director of Princeton's Center for Photonics and Optoelectronic Materials (POEM). From 1997-2001, he served as the Chair of the Princeton's Electrical Engineering Department. In 2006, he rejoined the University of Michigan as Vice President for Research, and as the William Gould Dow Collegiate Professor in Electrical Engineering, Materials Science and Engineering, and Physics. A Fellow of the IEEE and OSA and a member of the National Academy of Engineering, he received the IEEE/LEOS Distinguished Lecturer Award in 1996-97, and in 1998 he was co-recipient of the IPO National Distinguished Inventor Award as well as the Thomas Alva Edison Award for innovations in organic LEDs. In 1999, Prof. Forrest received the MRS Medal for work on organic thin films. In 2001, he was awarded the IEEE/LEOS William Streifer Scientific Achievement Award for advances made on photodetectors for optical communications systems. In 2006 he received the Jan Rajchman Prize from the Society for Information Display for invention of phosphorescent OLEDs, and is the recipient of the 2007 IEEE Daniel E. Nobel Award for innovations in OLEDs. Prof. Forrest has authored $\approx$400 papers in refereed journals, and has 155 patents. He is co-founder or founding participant in several companies, including Sensors Unlimited, Epitaxx, Inc., Global Photonic Energy Corp., Universal Display Corp. (NASDAQ: PANL) and ASIP, Inc. (now Apogee Photonics). Prof. Forrest's recent research interests include photovoltaic cells and the application of quantum-dots for increased solar cell efficiency.

D. RELATED PUBLICATIONS

1. "Intermediate-Band Solar Cells Employing Quantum Dots Embedded in an Energy Fence Barrier," Guodan Wei and Stephen R. Forrest, Nano Lett., 7 (1), 218–222, 2007.
2. "Enhanced Open Circuit Voltage in Subphthalocyanine/C60 Organic Photovoltaic Cells", K.L. Mutolo, E. I. Mayo, B. P. Rand, S. R. Forrest and M. E. Thompson, J. Am. Chem. Soc., 128, 8108 (2006).
3. "The limits to organic photovoltaic cell efficiency", S. R. Forrest, invited, MRS Bulletin, 30, 28 (2005).

4. ”Morphology control and material mixing by high-temperature organic vapor phase deposition and its application to thin-film solar cells”, F. Yang, M. Shtein and S. R. Forrest, J. Appl. Phys., 98, 014906 (2005).
5. ”A hybrid planar-mixed molecular heterojunction photovoltaic cell”, J. Xue, B. P. Rand, S. Uchida and S. R. Forrest, Adv. Mater., 17, 66 (2005).
6. ”Controlled growth of a molecular bulk heterojunction photovoltaic cell”, F. Yang, M. Shtein, and S. R. Forrest, Nat. Mater., 4, 39 (2004).
7. ”Asymmetric tandem organic photovoltaic cells with hybrid planar-mixed molecular heterojunctions”, J. Xue, B. P. Rand, S. Uchida and S. R. Forrest, Appl. Phys. Lett., 85, 5757 (2004).
8. ”Efficient bulk heterojunction photovoltaic cells based on small molecular weight organic thin films”, P. Peumans, S. Uchida and S. R. Forrest, Nature, 425, 158 (2003).
9. ”High photovoltage multiple-heterojunction organic solar cells incorporating interfacial metallic clusters”, A. Yakimov and S. R. Forrest, Appl. Phys. Lett., 80 1667 (2002).
10. ”Very high efficiency double heterostructure copper phthalocyanine/C60 photovoltaic cells”, P. Peumans and S. R. Forrest, Appl. Phys. Lett., 79, 126 (2001).
11. ”Ultrathin Organic Films Grown by Organic Molecular Beam Deposition and Related Techniques”, S. R. Forrest, Chem. Rev., 97, 1793 (1997).

E. RELATED PATENTS

1. 7,194,173 Organic devices having a fiber structure
2. 7,179,543 Doping of organic opto-electronic devices to extend reliability
3. 7,179,534 Conductive-polymer electronic switch
4. 7,173,369 Transparent contacts for organic devices
5. 7,151,217 Organic photosensitive optoelectronic devices with transparent electrodes
6. 7,078,113 Organic light emitting devices having carrier transporting layers comprising metal complexes
7. 7,061,011 Bipolar organic devices
8. 7,053,412 Grey scale bistable display
9. 7,026,187 Method of manufacturing high-mobility organic thin films using organic vapor phase deposition
10. 7,026,041 Organic photosensitive optoelectronic device with an exciton blocking layer
11. 7,025,277 Smart card composed of organic processing elements
12. 7,022,421 Organic light emitting devices having carrier blocking layers comprising metal complexes