

Understanding and Controlling Solar Energy Conversion: The Relationship between Nanostructure and Efficiency

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In this talk, I will discuss methods of controlling the nanostructure of organic thin films, and their relationship to their ability to harvest solar energy in the form of electricity. In particular, morphology control of materials using both liquid and vapor phase deposition technologies has been shown to create crystalline nanostructures that have achieved record high efficiencies of 6% in our lab. The fundamental physical origins of the photogeneration process will be considered [1, 2], and will be used to show that the maximum efficiency attainable with a single heterojunction organic solar cell is between 22% and 27%, in contrast to inorganic cells whose maximum theoretical efficiency is 31%.

[1] N. C. Giebink, B. E. Lassiter, G. P. Wiederrecht, M. R. Wasielewski, and S. R. Forrest, *Phys. Rev. B*, 82, 155306 (2010).

[2] N. C. Giebink, G. P. Wiederrecht, M. R. Wasielewski, and S. R. Forrest, *Phys. Rev. B*, 82, 155305 (2010).