Mechanical & Materials Engineering

Pierson Graduate Seminar

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Stability and performance of organic solar cells

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Photovoltaic (PV)energy conversion is a rapidly growing technology for converting solar energy into electricity. The current production is over 20 GW/year and the capital costs have come down dramatically to about $1.50 per watt, from over $100/W in the 1970s. The current generation of technology is mainly reliant on inorganic semiconducting materials such as Si and CdTe. A new material system, based on organic polymers, is making rapid strides towards becoming the low cost material of choice for PV energy conversion. However, the conversion efficiency of organic solar cells is rather low, still in the 10% range, whereas the inorganic cells based on c-Si routinely achieve over 20% conversion efficiency. A more difficult problem is that the performance of the organic materials degrades rather rapidly when subjected to light, making solar energy conversion using these materials not economically viable. In this talk, I will address the fundamental physics of organic solar cells and of instability, and several approaches towards solving these problems. I will show that novel structures, such a inorganic/organic hybrid tandem junction solar cells may offer a promise of both higher performance and better stability.

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