DNA Based Carbon Nanotube Porphyrin Nanohybrids Molecular Recognization and Regeneration

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In the search to improve solar cells, scientists are exploring new materials that will provide better current transfer. One material that has emerged as a strong contender is the single walled carbon nanotube (SWNT). Current DNA-SWNT based films combined with chromophores have poor operational lifetimes compared to commercial solar cells. Once exposed to light the chromophore begins to degrade, eventually rendering the solar cell unusable. To solve this problem, we used a method involving multiple steps. First we found which DNA sequences formed structures around the SWNT that could hold the most chromophores by using a spectrophotometer to test the concentration of chromophores on each film. Secondly we determined which chromophores generated the strongest current when exposed to light by testing the photocurrent of each film. Finally we searched for a chemical, or solution, that would remove damaged chromophores without damaging or removing the DNA or SWNTs from the film. Currently it has been found that DNA sequences high in guanine, which form G-quadruplexes, are ideal for holding chromophores. Through testing, we found that zinc porphyrin created the strongest current of the chromophores tried. Research still needs to be done to find an ideal solution for removing damaged chromophores, but progress has been made into making organic solar cells viable. Eventually automating this process, a solar cell could be repeatedly refunctionalized, thus extending the life of the solar cells indefinitely.