Intellectual Merit and Broader Impacts

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A radically new class of organic materials, the protected oligoacenes and polyacenes are the subject of the proposal. Unlike the much-explored conjugated polymers, these unsaturated macromolecules **will be electrical conductors without the need of a dopant; they will be the first <u>neutral, single component all-carbon organic conductors</u>**. The proposed macrocyclic version of the oligoacenes, the cyclacenes may exhibit even more exotic properties, such as superconductivity at higher temperatures. The proposed syntheses are relatively short, so that large amounts of material will be available for the evaluation of physical properties and device (FET, OLED, photodiode, etc) fabrication.

Organic electronic materials have just entered the commercial engineering mainstream in the form of light-emitting diodes (LEDs), photodiodes (plastic solar cells) and thin film transistors (TFTs). The LEDs produce brighter and cooler light than standard incandescent lamps and will have a large impact on society in terms of energy savings both in manufacturing and in use. An important societal benefit of the subject proposed is the considerable advance in the education of the graduate and undergraduate students supported by these funds. Development of these organic electronic devices will provide a truly interdisciplinary educational foundation for our future workforce.

An Oligoacene-Based Pure White Light Organic Light-Emitting Diode

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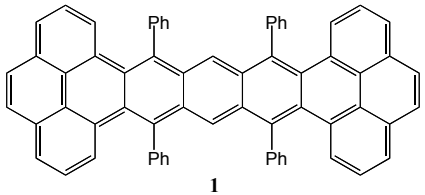
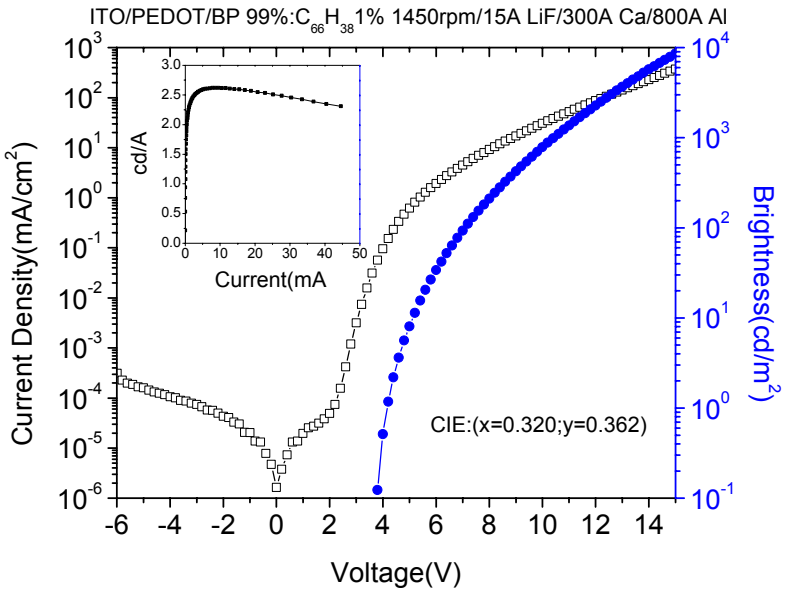
Organic light-emitting diodes (OLED) are just now commercially viable. The achievement of pure white light (CIE coordinates x = 0.33, y = 0.33 OLED's has been the subject of intense research in the recent past. The design and synthesis of the oligoacene **1** as a dopant in a poly-(fluorene) matrix produced light with CIE 0.32, 0.36; the closest ever. With this accomplishment, the community is poised to produce "cold light" light bulbs as well as flat panel lighting for many purposes. Compound **1** was synthesized in an economic, efficient synthesis*



1



Device characteristics of OLED

* Duong, H.; Bendikov, M.; Steiger, D.; Zhang, Q.; Sonmez, G.; Yamada, J.; Wudl, F. *Org. Lett.* **2003**, in press