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Device applications and structural and optical properties of Indigo – A biodegradable, low-cost organic semiconductor ZHENGJUN WANG, KELLY L. PISANE, Department of Physics and Astronomy, West Virginia University, KONSTANTINOS SIERROS, Department of Mechanical and Aerospace Engineering, West Virginia University, MOHINDAR S. SEEHRA, Department of Physics and Astronomy, West Virginia University, DIMITRIS KORAKAKIS, Lane Department of Computer Science and Electrical Engineering, West Virginia University — Currently, memory devices based on organic materials are attracting great attention due to their simplicity in device structure, mechanical flexibility, potential for scalability, low-cost potential, low-power operation, and large capacity for data storage [1]. In a recent paper from our group, Indigo-based nonvolatile organic write-once-read-many-times (WORM) memory device, consisting of a 100nm layer of indigo sandwiched between an indium tin oxide (ITO) cathode and an Al anode, has been reported [2]. This device is found to be at its low resistance state (ON state) and can be switched to high resistance state (OFF state) by applying a positive bias with ON/OFF current ratio of the device being up to $1.02 \times e6$. A summary of these results along with the structural and optical properties of indigo powder will be reported. Analysis of x-ray diffraction shows a monoclinic structure with lattice parameters $a(b)[c] = 0.924(0.577)[0.1222]$ nm and $\beta = 117^\circ$. Optical absorption shows a band edge at 1.70 eV with peak of absorption occurring at 1.90 eV. These results will be interpreted in terms of the HOMO-LUMO bands of Indigo.

[1] L. Ma et al, Appl. Phys. Lett. 84, 4908 (2004).

[2] Z. Wang et al, Appl. Phys. Lett. (submitted).

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