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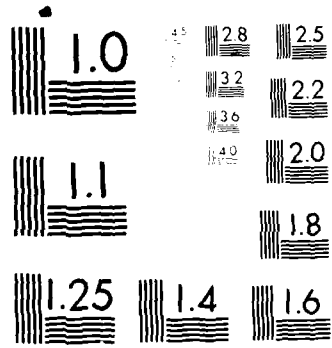
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FINAL REPORT FOR CONTRACT N00014-78-C-0633  
EXCITED-STATE PROPERTIES OF SEMICONDUCTOR ELECTRODES AND  
THEIR APPLICATION TO OPTICAL ENERGY CONVERSION  
ARTHUR B. ELLIS, PRINCIPAL INVESTIGATOR

Over the past seven years we have examined the luminescent properties of a variety of n-type II-VI and III-V semiconductor electrodes. Photoluminescence (PL) from CdS:Te, CdS<sub>x</sub>Se<sub>1-x</sub> ( $0 < x < 1$ ), graded CdS<sub>x</sub>Se<sub>1-x</sub>, ZnSe:Al and GaAs electrodes can be quenched by applied potential in aqueous chalcogenide electrolytes. For the spatially homogeneous systems, quenching accords well with a dead-layer model: electron-hole pairs formed within a distance on the order of the depletion width do not contribute to PL. The PL quenching properties thus afford a means for mapping the electric field in the semiconductor electrode. For the graded electrodes, PL is color-coded to spatially resolve the recombination of electron-hole pairs. All of these materials also exhibit electroluminescence (EL) in aqueous peroxydisulfate electrolyte. The graded samples can be used in the construction of novel display devices exhibiting patterned, multi-colored emission. More recently, Schottky diodes, consisting of a thin layer of Pd on CdS and on graded CdS<sub>x</sub>Se<sub>1-x</sub> samples, have been prepared. The PL from these diodes is sensitive to H<sub>2</sub>: for the CdS-based structure, PL intensity changes are in accord with the dead-layer model; for the graded CdS<sub>x</sub>Se<sub>1-x</sub>-based structure, the spectral distribution is altered. These effects can be exploited for optically-coupled chemical sensing using fiber optics.

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PUBLICATIONS, TECHNICAL REPORTS, AND PATENTS FROM CONTRACT  
N00014-78-C-0633. ARTHUR B. ELLIS, PRINCIPAL INVESTIGATOR

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assigned to the Wisconsin Alumni Research Foundation.

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U.S. Patent Application Serial No. 480,471 filed 3/30/83  
by A.B. Ellis and M.K. Carpenter. The invention has been  
assigned to the 3M Co. The application has also been  
filed in Canada (3/29/84), Europe (3/28/84), and Japan  
(3/29/84).

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Patent Application Serial No. 712,799 filed 3/18/85 by  
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assigned to the 3M Co.

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