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HOLE-DIFFUSION LENGTH AND TRANSPORT PARAMETERS OF THIN CdS FILMS FROM A SCHOTTKY BARRIER

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The minority carrier diffusion length of semiconductor thin films in polycrystalline form is determined with a good precision by EBIC and LBIC techniques (1,2). The electron or laser beam used is scanned across the junction. The principle applied in these cases might be attractive for the semiconducting hand side of liquid Schottky barriers. However, these techniques cannot be easily used for such junctions. The methods based on the Gardner approach (3) remain so far more convenient here, especially when very thin films are concerned. In this context, two independent techniques, namely, the surface photovoltage (SPV) (4) and the photoelectrochemical (5) measurements served in this work.

The optoelectronic and transport properties of thin sprayed CdS films, having a thickness of less than 2 μm are reported (6). The two techniques used led to a good agreement in the hole-diffusion length values. These range from 0.017 to 0.15 μm and behaved differently in two zones. A rapid increase of this parameter is observed below a film thickness of 0.4 μm. Above this thickness, the value obtained is constant. Specific space-charge widths are expected because of the respective measurement conditions. The hole-diffusion length decreases as carrier density increases. The hole lifetime shows a regular decreases as the thickness factor increases, while the hole-diffusion coefficient and mobility patterns are similar to that of the photocurrent.

References
(3) W.W. GARTNER, Phys. Rev. 84 (1959)