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[54] **METHOD FOR DETERMINING INTERFACE PROPERTIES OF SEMICONDUCTOR MATERIALS BY PHOTOREFLECTANCE**

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[58] **Field of Search** .... 356/432 T, 319, 445, 356/432, 417

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,142,802 3/1979 Pollak et al. 356/319

4,807,991 2/1989 Carew 356/72

4,889,565 12/1989 Fan et al. 136/256

OTHER PUBLICATIONS

Shen et al, "New Normalization Procedure for Modulation Spectroscopy," Rev. Sci. Instrum. vol. 58, #8, Aug. 1987, pp. 1429–1432.

Glembocki et al, "Photoreflectance Characteristics of GaAs/AlGaAs Thin Films, Heterojunctions and Multiple Quantum Well Structures," SPIE, vol. 524, Spectroscopic Characterization Techniques for Semiconductor Technology II, 1985 pp. 86–94.

Photoelectrochemistry and Electrosynthesis on Semiconductor Materials, Ginley et al, vol. 88–14, pp. 468–476.

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[57] **ABSTRACT**

A method for determining information about properties at interfaces of semi-conductor materials in which a probe bean monochromatic light is directed onto a material sample which is itself electromodulated by a modulated pump beam, whereby the light reflected from the sample is detected to produce a d.c. signal and an a.c. signal, and after normalizing the procedure, the shifts of energy gaps in the band gaps are evaluated to obtain information about at least one externally applied parameter crossing such shift.

4 Claims, 2 Drawing Sheets