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Aspnes et al.

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(54) **THIN FILM OPTICAL MEASUREMENT SYSTEM AND METHOD WITH CALIBRATING ELLIPSOMETER**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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This patent is subject to a terminal disclaimer.

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(57) **ABSTRACT**

Related U.S. Application Data

(63) Continuation of application No. 09/247,121, filed on Feb. 8, 1999, now Pat. No. 6,304,326, which is a continuation of application No. 09/098,880, filed on Jun. 17, 1998, now Pat. No. 5,900,939, which is a continuation of application No. 08/890,697, filed on Jul. 11, 1997, now Pat. No. 5,798,837.

An optical measurement system for evaluating a reference sample that has at least a partially known composition. The optical measurement system includes a reference ellipsometer and at least one non-contact optical measurement device. The reference ellipsometer includes a light generator, an analyzer and a detector. The light generator generates a beam of quasi-monochromatic light having a known wavelength and a known polarization for interacting with the reference sample. The beam is directed at a non-normal angle of incidence relative to the reference sample to interact with the reference sample. The analyzer creates interference between the S and P polarized components in the light beam after the light beam has interacted with reference sample. The detector measures the intensity of the light beam after it has passed through the analyzer. A processor determines the polarization state of the light beam entering the analyzer from the intensity measured by the detector, and determines an optical property of the reference sample based upon the determined polarization state, the known wavelength of light from the light generator and the composition of the reference sample. The processor also operates the optical measurement device to measure an optical parameter of the reference sample. The processor calibrates the optical measurement device by comparing the measured optical parameter from the optical measurement device to the determined optical property from the reference ellipsometer.

(51) **Int. Cl.⁷** **G01J 4/00**
(52) **U.S. Cl.** **356/369**
(58) **Field of Search** 356/364, 365, 356/366, 367, 368, 369, 630, 631; 250/225

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12 Claims, 3 Drawing Sheets

