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AUTOMATED DETERMINATION OF ELECTRICAL TRANSPORT PROPERTIES OF THIN FILMS USING A FABRICATED FOUR-POINT PROBE

There has been a drastic growth microelectronics industry in the recent past. These industries utilize different materials, the main being semiconductors. The performance of these materials relies on its structural, electrical and optical properties depending on the application. Therefore, there is always a need to undertake measurements of the semiconductor characteristics in a manner that is precise, cheaper and faster. Some of the desirable features of measurements include usability, accuracy, resolution, repeatability, and consistency which cannot be assured with manually operated systems. This study strives to design and interface an automated computer-aided four-point probe system that will provide a means of determining electrical transport parameters such as resistivity, charge carrier type, charge density and carrier mobility. A four-point probe head based on Van der Pauw set up, NI's Keithley's 6220 Precision current source, NI's Keithley's 6001 switch and NI's Keithley's 2182A Nanovoltmeter instruments will be interfaced with NI's LabVIEW program running in a computer through a USB to a GPIB hub for its full control. The four-probe head will be used for purposes of probing the samples with a square symmetry that will be adopted for the measurement of the semiconductor electric transport properties. Reliability tests will be carried out by measuring the electrical properties of a standard sample and compare with the expected results. This work will form a basis for automating similar systems that were inherently designed to be operated manually.

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