LOW FREQUENCY DIELECTRIC CONSTANT OF LOW RESISTIVITY SOLIDS

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Low frequency dielectric constant is a parameter of great interest in calculations involved in several theoretical models. This information in the case of high resistivity material is usually obtained from the measurement of the capacitance when the sample is held between two rigid metallic electrodes and the corresponding air capacitance without the sample between the electrodes[1]. This method cannot be applied to low resistivity solids where the electrodes would be shorted. This is the principal reason for the dearth of low frequency, room temperature dielectric constant data of semiconducting materials.

It appears that a method described by Lynch[2] which has, in principle, the potentiality of measuring the dielectric constant of low resistivity solids has been overlooked. The method consists of placing the sample on the lower rigid electrode of the measuring cell without the upper electrode coming into contact with the sample, thus leaving a small air gap between the upper electrode and the top surface of the sample and then noting the capacitance. The sample is then removed and the upper electrode lowered until the capacitance between the electrodes is restored back to the original value. The distance t_x through which the upper electrode has been lowered is measured. It can be shown that the dielectric constant ε is given by the relation[2]

$$\varepsilon = t_s/(t_s - t_x), \qquad (1)$$

where t_s is the thickness of the sample.

It is seen from (1) that determination of ε does not involve the measurement of either electrode area or absolute capacitance. The accuracy of the method is limited by the errors in the measurement of t_s and t_x and the overall error in the value of ε can be as low as 0.1%. The advantages of this method are that (a) it avoids the need for applying any conducting contacts on the sample (b) no pressure need be applied to the sample so that the method is suitable for soft, yielding and brittle samples, and (c) no absolute measurement of capacitance is needed. Recently the authors have used this method to measure the dielectric constant of mercuric iodide pellets. The ε value thus obtained was in good agreement with that obtained by conventional method[1].

This method has now been applied to low resistivity semiconducting material. Measurements were made on single crystals of *p*-type silicon having resistivity of 50 Ω cm. The crystals were 1 cm in diameter and 4 mm thick. The ε value at 1 kHz was 2000 at room temperature. Rao and Smakula[3] have measured the frequency and also temperature dependence of ε of single crystals of silicon having a resistivity of 16000 Ω cm by conventional method. The dielectric constant at room temperature decreased from a value ~ 8000 at 1 kHz and reached a constant value of 12 above 10 MHz. They also measured ε of some low resistivity (12.5 and 1000 Ω cm) silicon crystals but these measurements were confined to only low temperatures (100°K and below). No comparison of our ε value is thus possible. It may, however, be mentioned that the accuracy of the present[2] method is not very high when the dielectric constant is very large.

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2. Lynch, A. C., *Proc. I.E.E.*, 1957, **B104**, 359.
3. Rao, K. V. and Smakula, A., *J. Appl. Phys.*, 1966, **37**, 2840.

DI-C-GLYCOSYL FLAVONE FROM *PREMNA TOMENTOSA*

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THE isolation and structural elucidation of a flavone-6,8-di-C-glycoside, from the heart wood of *Premna tomentosa* (fam-Verbenaceae) is reported in this paper. This plant is known for its medicinal properties[1].

The air-dried heartwood of the plant after defatting with petroleum ether was extracted with methanol. The solid obtained after concentrating the methanol extract was triturated with water, and the aqueous solution was extracted with *n*-butanol, which on concentration afforded a yellow solid and was crystallized from methanol-acetone to yield a pale yellow substance designated as PT-1 (I) (0.3% yield).

PT-1 mp. 210–15° was analysed for $C_{26}H_{28}O_{14}$ and M^+ 564. It gave orange colour in Shinoda test[2] suggesting the presence of a flavonoid skeleton. It gave a violet colouration with alcoholic $FeCl_3$ due to the