

DEC-600

Dielectric Measurement Setup

Measurement of dielectric constant at high temperature (ambient to 600°C)

Introduction

Beside the common and well known application of capacitors in electrical and electronic circuits, the capacitors with an exposed and porous dielectric can be used to measure humidity in air. A huge leap in the research on dielectrics (ferroelectric materials) came in 1950's, leading to the wide spread use of ceramics in capacitor applications and piezoelectric transducer devices. Since then, many other ferroelectric ceramics have been developed and utilized for a variety of applications: various type of capacitors, nonvolatile memories in computers, etc.



Description of the Experiment Set-up

1. Probes Arrangement

It has two individually spring loaded probes. The probes arrangement is mounted in a suitable stand of high quality alumina which also holds the sample plate. To ensure the correct measurement of sample temperature, the thermocouple junction is embedded in the sample plate just below the sample. This stand also serves as the lid of temperature controlled oven. Proper leads are provided for connection to Capacitance Meter and Temperature Controller.

2. Sample

Modified lead titanate (test sample)

3. Oven

This is a high quality temperature controlled oven. The heating element used is a high grade Kanthal-D. It is cover. Further the top portion is also suitably covered to meet the safety standard. The oven has been designed for fast heating and cooling rates, which enhances the effectiveness of the controller.

4. Main Units

The Set-up consists of two units housed in the same cabinet.

(i) Temperature Controller

It is a high quality PID controller where the temperatures can be set and controlled easily. P, I and D can be adjusted by the user and can also be kept on Auto-tuning.

Specification

Temperature Range	Ambient to 600° C
Power Supply	100-240VAC; 50/60Hz
Display Method	7 Segment LED display [Processing value (PV) :Red, Setting value (SV) :Green]
Input Sensor	Thermocouple (Chromel - Alumel)
Control Method	PID, ON/OFF Control, P, PI, PD, PIDF, PIDS
Display Accuracy	± 0.3%
Setting Type	Setting by front push buttons
Proportional Band (P)	0 to 100.0%
Integral Time (I)	0 to 3600 Sec
Derivative Time (D)	0 to 3600 Sec
Sampling Time	0 to 120 Sec
Sampling Time	0.5 Sec
Setting (P, I & D)	Manual / Auto

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(ii) Digital Capacitance Meter

It is a handheld instrument, mounted in a cabinet for convenience, It uses CMOS double level A/D convertor that is automatic in zeroing and polar selection.

Features

- LCD Display
- Data - Hold Switch (HOLD)
- Cx+, Cx - Input Jack
- Back Light Button Switch
- Rotary Switch: Use this switch to select functions and ranges
- Wide measuring range, covering 9 measuring sections from 0.1pf to 20,000 μ F that includes nominal value of any capacitance
- Power: One 9V battery

Specification

Range	Accuracy	Definition	Testing frequency
200pF	$\pm 0.5\%$	0.1pF	800Hz
2000pF	$\pm 0.5\%$	1pF	800Hz
20nF	$\pm 0.5\%$	10pF	800Hz
200nF	$\pm 0.5\%$	0.1pF	800Hz
2 μ F	$\pm 0.5\%$	1nF	800Hz
20 μ F	$\pm 0.5\%$	10nF	80Hz
200 μ F	$\pm 0.5\%$	0.1 μ F	8Hz
2000 μ F	$\pm 2.5\%$	1 μ F	8Hz