Amendment-01-04-2015

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DIFFERENTIAL SCANING CALORIMETER

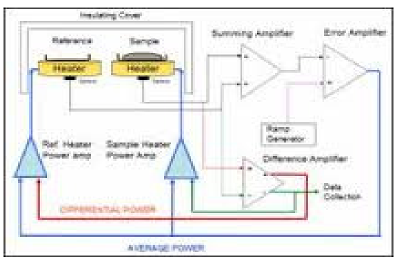
Introduction: MDSCM series of differential scanning calorimeter are in more than 10 different modes, virtually offering solutions to detect physical transformation like Melting transitions, Tm,The glass transition, Tg- Thermal Stability of any solid/liquid by measuring change in specific heat of sample, Glass Transition temperatures,• Melting points and boiling points,• Crystallization time and temperature,• percent crystallinity, Heats of fusion and reaction, Specific heat, Oxidative stability, Rate of cure, Degree of cure, Reaction kinetics, Purity , Thermal stability. It operates in isothermal or adiabatic mode. It has a vast number of industrial applications, thermoplastics. For example, calorimeters can determine: oxidation time of polyethylene, curing percentage of epoxy, anti-oxide of lubricant, Enthalpy change of material, glass transition temperature, extrapolated onset temperature, Melting point for crystalline polymer.

Its main advantages are……..

- High sensitivity – for weak transitions/ Outstanding resolution – separation of closely lying effects
- Automation – high sample throughput and efficiency/ Large measurements range – for large and small effects
- Small and large sample volumes – for small samples and inhomogeneous materials/Modular design – allows future expansion to meet new needs
- Wide temperature range – from -150 to 700 °C in one run

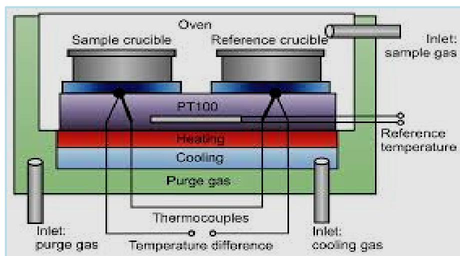
Operating Principle: In this technique , It measures the difference in heat flow rate (mW = mJ/sec) between a sample and inert reference as a function of time and temperature Further the temperature program for a DSC analysis is designed such that the sample holder temperature increases linearly as a function of time. The reference sample should have a well-defined heat capacity over the range of temperatures to be scanned. Here, Heat Flow – Endothermic: heat flows into the sample as a result of either heat capacity (heating) or some endothermic process (Tg, melting, evaporation, etc.) – Exothermic: heat flows out of the sample as a result of either heat capacity (cooling) or some exothermic process (crystallization, cure, oxidation, etc.)

$dH/dt = Cp.dT/dt + f(T,t)$. H:enthalpy, Cp-specific heat constant-reversing, dT= rate of change of temperature, dH/dt= total rate of change of heat flow, f(T,t)= *f* (T, t) =Heat flow that is function of time,-non-reverse heating, Cp.dT/dt-reverse heating



CONTROL CIRCUIT OF dsc

MDSCM- 500



pictorial representation of DSC

MDSCM-050

MDSCM-100200

Schematic of insertion type thermal mass DSC

ELECTRICAL/MECHANICAL SPECIFICATIONs OF DSC ANALYZER

model	+/- Heat rate mili-.atts/gram	Temperature Deg.Cel	Resolution Watt/gram	Cel	Accuracy %	Repeatability %	Sample weight m.gram	Thermal Burdon	Gas Purge rate
MDSCM-0100300	0100.0	05.0/02.0 -999999 mili°C 0009999-0999999 °C	99.99	100	99.9	100	1.0-100 .0	< 100 mili °C	<1.8x10
MDSCM0200300	0500.0	05.0/01.0 -999999 mili°C 0999.99-0999999°C	99.9	100	99.	100	1.0-100.0	< 100 mili °C	<1.8x10
MDSCM-0500800	1000.0	10.0/05.0 -999999mu°C 0.999999-0999999°C	99.99	100	99.9	100	1.0-100 .0	< 100 micro °C	<1.8x10
MDSCM-1000800	05000.0	10.0/01.0 -999999mu °C 0.999999-0999999°C	99.9	100	99.	100	1.0-100.0	< 100 micro °C	<1.8x10
MDSCM-2000800	010000.0	05.0/02.0 -999999 mili°C 0009999-0999999 °C	99.99	100	99.9	100	1.0-100 .0	< 100 mili °C	<1.8x10

Differential scanning calorimeter specification:

Operating voltage 220 volts
Power: not above 400 watts.
Temperature range: air cooling RT ... -70°C ... 700 °C in three steps in multiple of 10
Heat rate range: +/- 10-1000 mili-watts /gram in three steps in multiple of 10
Temperature/Heat rate measurement range: as above with 10 mili-kelvin/1.0 mili watt accuracy
Mass: 0.1-1000.0 miligram
cryostat cooling; UPTO 70 °C to 700 °C
Intra Cooler -65 °C ... 450 °C -65 °C ... 700 °C
liquid nitrogen cooling -150 °C ... 500 °C -150 °C ... 700 °C
Temperature accuracy1: ±0.2 K
Temperature precision1: ±0.02 K
Heating rate2: RT ... 700 °C 0.01 ... 300 K/min (continuously)
Cooling rate2: 0.01 ... 50 K/min
Cooling time: air cooling (maximum ... 100 °C) 8 min 9 min

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DIFFERENTIAL SCANING CALORIMETER

cryostat cooling (100 °C ... 0 °C) 5 min
Intra Cooler (100 °C ...0 °C) 5 min
liquid nitrogen cooling (100 °C ... -100 °C) 15 min
thermal measurement: thermopile
Input capacitance: 10 nF
Response time: 1000 sample/sec
Burden: less than 100 micro volt/full scales current or better
Accuracy error : 1.0 % reading
Repeatability: 100 of reading
Resolution: 10.0 nV & 1/5 nano amps or optional
Linearity adjustment: upto 100 count
Input impedence: ultra high (<1000 nano volt burdon),
Filtering: low pass(adjustable)
Offset: variable upto 10,000 count (manual/auto)
CMMR: >80 db at 50-60 Hz
Isolation: > 100 giga ohm
Connector: BNC-9 pinx2 and BNC-25 pinx2
Signal time constant 1.7 s 3.9 s
Indium peak height to width 17.0 6.9
TAWN resolution 0.12 0.30
sensitivity 11.9 56.5
Measurement range 100 °C ±350 mW ±160 mW
700 °C (FRS5) / 500 °C (HSS7) ±200 mW ±140 mW
Resolution 0.04 µW 0.01 µW
Digital resolution 16 million points
Sampling
Sampling rate: maximum 50 values/second
Interface: -RS-232

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