



IMPERIAL INSTITUTE OF CERAMICS SCIENCE & TECHNOLOGY

MUNJMAHUDA

AKOTA -390020, VADODARA, GUJARAT.

## SCHEDULE OF TESTING CHARGES

WITH EFFECT FROM 15<sup>TH</sup> March 2020

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1. TRANSMISSION ELECTRON MICROSCOPY (TEM)
2. ENERGY DISPERSIVE X-Ray ANALYSIS (EDX)
3. ATOMIC FORCE MICROSCOPY (AFM)
4. RESIN TESTING AND COMPOSITE TESTING
5. FIELD EMISSION SCANNING ELECTRON MICROSCOPY
6. ELEMENTAL ANALYSIS BY ENERGY DISPERSIVE X- Ray ANALYSIS (EDX)
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9. GLASS DIVISION TESTING
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11. ANALYTICAL CHEMISTRY- ELEMENTAL ANALYSIS
12. NON-OXIDE CERAMICS & COMPOSITES TESTING
13. REFRACTORY
14. TRADITIONAL CERAMICS TESTING

## ADVANCED MATERIALS CHARACTERIZATION UNIT (AMCU)

### *TRANSMISSION ELECTRON MICROSCOPY (TEM)*

Sl. No.	Name of the Test(s)	Sample Size & Volume/Quantity	Rate(s) per Sample(Rs.)
1.	Transmission Electron Microscope (TEM) studies (Includes powder sample preparation only and 6 micrographs)	Powder: 100mg(min) 1 gm (max)	11918.00
2.	Additional Micrographs (a package of 4)	-----	1298.00

#### Sample Preparation for TEM Study

1.	For bulk sample	3 D x 10 L (mm, min) 10 x 10 x 20(mm,max)	4838.00
2.	For Cross-sectional view of thin films/layers on substrates	2.5W x 10L x 0.2T(min) 2.5W x 10L x 1T(min)	7316.00

#### EDAX Analysis

Sl. No.	Name of the Test(s)	Sample Size & Volume/Quantity	Rate(s) per Sample(Rs.)
1.	Elemental Analysis by Energy Dispersive X-Ray Analysis (EDX) in SEM/FESEM/TEM (Including conductive coating).	Same as TEM sample	7316.00
2.	Elemental Distribution Analysis EDX Line Scanning in SEM / FESEM/TEM (Including conductive coating) (EDX-LS)	- Do -	9558.00
3.	Elemental Distribution Analysis EDX Dot Mapping in SEM / FESEM/TEM (Including conductive coating) (EDX-DM)	- Do -	9558.00

#### ATOMIC FORCE MICROSCOPY (AFM)

Sl. No.	Name of the Test(s)	Sample Size & Volume/Quantity	Rate(s) per Sample(Rs.)
1.	Normal AFM tapping mode(AF-T)/Contact mode scan (AF-C)	5 x 5 x 0.5mm (min) 20 x 20 x 3mm (max)	8260.00
2.	Nano-Indentation (AF-N)	- Do -	14514.00
3.	Special Scans (Under liquid, Thermal Conductivity, Electrical resistivity) (AF-S)	20 x 20 x 3mm	14514.00
4.	Any extra analysis (like roughness, grain size etc.) will involve extra cost per sample. (AF-R/GS)	15 x 15 x 10mm(max)	1298.00
5.	Sample preparation charge – per sample (AF-SP)	-----	1062.00

**Special Note: Imaging of each sample enables scanning at 3 (three) different locations, image post processing, 2D/3D morphology & sectional analysis**

**ADVANCED MECHANICAL & MATERIALS CHARACTERIZATION DIVISION  
(AMMCD)**

Sl. No.	Name of the Test(s)	Sample Size & Volume/Quantity	Rate(s) per Sample(Rs.)
1.	Glass to Resin Ratio (Glass/Ash content) as per IS:10182	6" x 6" – 1No. (Laminated Sheet) 2' x 1'6"- 1No.(Corrugated Sheet)	1534.00
2.	Density/Specific Gravity (Composites) FRP/Plastics-ASTM:0792, IS: 10182, D4762-11a	IS: Standard – 1" x 15" – 1 No 4" x 4" – 1No. (Laminated Sheet) 2' x 1'6"- 1No.(Corrugated Sheet)	1534.00
3.	Viscosity (Liquid) Resin/ Favicall as per D2857-95(2007)	Minimum: 500 ml.	2478.00
4.	Monomer Content (Resin)/Solid Content as per D3749-08	Minimum: 100 ml.	1532.00
5.	Gel Time of Resin, as per ASTM:2471	Minimum: 500 ml.	1810.00
6.	Gel Time with Peak Exothermic Temperature (Resin) as per ASTM:D2471	Minimum: 500 ml.	2478.00
7.	Fibre Diameter Measure as per D619-99(2004) TEX MEASUREMENT	1 Meter	1062.00
8.	Barcol / Shore Hardness (for Barcol Hardness ASTM:D2583, IS:12866 & BS:4994)	2" x2" - 1 NO.(Laminated Sheet) 2' x 1'6"- 1No.(Corrugated Sheet)	1062.00
9.	Water Absorption as per C1585-11, FRP/Plastics-ASTM:D570, IS: 10182 & BS:2782	10"x 10"- 1No.(Laminated Sheet) 2' x 1'6"- 1No.(Corrugated Sheet)	1534.00
10.	Tensile Test of Metals: as per E8M-11 & ASTM:E8 a) Crosshead speed<0.5 mm/min (1Pc.) b) -do- (5Pcs.) c) Crosshead speed>0.5 mm/min (1Pc.) d) -do- (5Pcs.)	Sample prepared by party as per our requirement.	1534.00 6254.00 826.00 3776.00
11.	a) Flexural Test (Cross-breaking) of Glass, Ceramic & Composites (5Pcs. set) as per C1341-06 (advanced ceramics) Glass-ASTM: C158 Ceramic- ASTM: C674 & C689 FRP/Plastics- ASTM: D790, BS: 2782 & IS: 10182.	Sample prepared by party as per our requirement. Bar Sample: Glass: T 10x L 250x W 50mm Ceramic: T 5-10 mm x L 130-150mm x W 25mm Cement/plaster: T 25x L 250x W 12.7mm. Porous: T 8 x L 120 x W 10mm Rod Sample: Glass: D 6-8mm x L 120mm Ceramic: D 4mm x L 120mm	2478.00
	b) Young's Modulus of Glass, Ceramic Glass-ASTM: C158 Ceramic- ASTM: C674 & C689 FRP/Plastics- ASTM: D790, BS:2782 & IS: 10182.	For Ceramic (5Pcs. set): sample size : 60x6x5 or50x5x4 mm	2478.00
12.	a) Tensile Test of Composites, Rubber & Polymers (5pcs.) b) Young's/E-modulus of Composites, Rubber & Plastics (5pcs. set), c) Percent Elongation of Composites, Plastics etc. (5Pcs. set) as per D638-10, FRP/Plastics- ASTM: D638, BS: 2782 & IS: 10182.	Laminated Sheet (>3mm-<10mm) for IS: Stander 15"x15"- 2 nos. ASTM: Standard 12"x12"- 2 nos.	2478.00 2478.00 2478.00

13.	Tensile Test of Single Fibre (10pcs.) as per ASTM: D3379	Specimen prepare by party otherwise extra charge will be include	3776.00
14.	Impact Test of Glass, Ceramic, Composites & Plastics (Charpy & Izod – 10pcs. set) as per E 1876-09, FRP/Plastics- ASTM: D256, BS: 2782 & IS: 10182.	Single laminate sheet- 12” x 12” (Thickness > 4mm)	2478.00
15.	Load Deflection Test (FRP Corrugated Sheet) as per D 5944-96, ASTM:D3379, IS:12866, BS: 4154	5’ x 3’6” Min. or 5’6” x 4’ - 3pcs.	2478.00
16.	Bolt-Shear Test (FRP Corrugated Sheet), as per D 4435-08	2’ x 1’6”- 1No.(Corrugated Sheet)	2478.00
17.	Particle Size Distribution using Image Analyser (Set per Sample)	SEM Photocopy	6254.00
18.	Heat Distortion Temperature (H.D.T.) (Composite or Cast Resin) as per D 4435-08	110mm x 10mm x 10mm – 4 Nos.	3186.00
19.	Flammability/Fire Retardance	1’ x1’ – 1 No (Laminated Sheet)	3186.00
20.	Young’s Modulus by Resonance as per D 4435-08 (Elastosonic) (As per ASTM Standard)	100mm x 10mm x 6mm – 5 Nos. (Parallel Surface)	4130.00
21.	Compressive Strength/ Crushing Load as per C1424-10	6” x 6”–1no.(Laminated Sheet) Cement/ Plaster Sample: 25mm. Cube – 6No Ceramic Sample: 10mm. Cube – 6No Porous Sample: 15mm. Cube – 6No	2478.00
22.	Vicker’s Hardness/ Micro Hardness (Ceramic/Glass/Mattel) as per C1327-08	Ceramic Sample: 8” x 8” x 8” Cube – 6No 10 mm dia x 4 mm T	3186.00
	Special Mechanical Testing Facilities**		
23.	Vicker’s Macro hardness Data using Macro indenter (100-300 N load) (data only) Sample size : 20x20x5 mm parallelepiped samples or 25 mm dia disks		5192.00
24.	Vicker’s Macro hardness Data of Bulk Glass and Ceramics using Macro indenter (100-300 N load) with data and indent’s optical picture with scale bar, Sample size : 20x20x5 mm parallelepiped samples or 25 mm dia disks		6254.00
25.	Vicker’s Micro hardness Data of Bulk Glass and Ceramics using Micro indenter (10-30 N load)(data only) Sample size : 20x20x5 mm parallelepiped samples or 25 mm dia disks, thickness – 10 mm		4130.00
26.	Vicker’s Micro hardness Data of Data Bulk Glass and Ceramics using Macro indenter (10-30 N load) with data and indent’s optical picture with scale bar, Sample size : 20x20x5 mm parallelepiped samples or 25 mm dia disks, thickness – 10 mm		5192.00
27.	Fracture Toughness of Bulk Glass and Ceramics by the Single Edge Notched Beam (SENB) Technique (data only), Sample size : 50x5x4 mm parallelepiped samples		8260.00
28.	Fracture Toughness of Bulk Glass and Ceramics by the Single Edge Notched Beam (SENB) Technique (data only) along with load displacement plots, Sample size : 50x5x4 mm parallelepiped samples		10384.00
29.	Fracture Toughness of Bulk Glass and Ceramics by the Indentation Method using Macro indenter (100-300 N load) (data only), Sample size : 25x25x10 mm parallelepiped samples or 25 mm dia disks, thickness – 10 mm		6254.00

30.	Fracture Toughness by the Indentation Method using Macro indenter (100-300 N load) with indent's optical pictures with scale bar, Sample size : 25x25x10 mm parallelepiped samples or 25 mm dia disks, thickness – 10 mm	8260.00
31.	Fracture Toughness by the Indentation Method using Macro indenter (100-300 N load) with optical pictures with scale bar and crack length and hardness data, Sample size : 25x25x10 mm parallelepiped samples or 25 mm dia disks, thickness – 10 mm	10384.00
32.	Fracture Toughness by the Indentation Method using Micro indenter (10-30 N load) (data only), Sample size : 25x25x10 mm parallelepiped samples or 25 mm dia disks, thickness – 10 mm	5192.00
33.	Fracture Toughness by the Indentation Method using Micro indenter (10-30 N load) with optical pictures with scale bar, Sample size : 25x25x10 mm parallelepiped samples or 25 mm dia disks, thickness – 10 mm	6254.00
34.	Fracture Toughness by the Indentation Method using Micro indenter (10-30 N load) with optical pictures with scale bar and crack length and hardness data, Sample size : 25x25x10 mm parallelepiped samples or 25 mm dia disks, thickness – 10 mm	8260.00
35.	Fracture Toughness of thin films using Nano-Indenter at load range (0.4 – 1000 mN) (data only), Sample size : 25x25 mm by t (micron) [t-film thickness]	8260.00
36.	Fracture Toughness of thin films using Nano-Indenter at load range (0.4 mN – 1000 mN) along with load depth plots, Sample size : 25x25 mm by t (micron) [t-film thickness]	10384.00
37.	Fracture Toughness of ceramic coatings using Nano-Indenter at load range (0.4 mN – 1000 mN) (data only), Sample size : 25x25 mm by t (micron) [t-film thickness]	8260.00
38.	Fracture Toughness of ceramic coatings using Nano-Indenter at load range (0.4 mN – 1000 mN) along with load depth plots, Sample size : 25x25 mm by t (micron) [t-film thickness]	10384.00
39.	Nanohardness of Glass using Nano-Indenter (0.4 mN-1000 mN), Sample size : 25x25x10 mm	6254.00
40.	Nanohardness of Glass using Nano-Indenter at load range of 0.4 mN-1000 mN with indent's optical pictures with scale bar, Sample size : 25x25x10 mm	8260.00
41.	Nanohardness of Glass using Nano-Indenter (0.4 mN-1000 mN) along with indent's optical pictures with scale bar and load depth plots, Sample size : 25x25x10 mm	10384.00
42.	Nanohardness of Bulk ceramics using Nano-Indenter at load range 0.4 mN– 1000 mN (data only), Sample size : 25x25x10 mm	6254.00
43.	Nanohardness of Bulk Ceramics using Nano-Indenter at load range of 0.4 mN - 1000 mN with indent's optical pictures with scale bar, Sample size : 25x25x10 mm	8260.00
44.	Nanohardness of Bulk Ceramics using Nano-Indenter at load range of 0.4 mN- 1000 mN along with indent's optical pictures with scale bar and load depth plots, Sample size : 25x25x10 mm	10384.00
45.	Nanohardness of ceramic thin films using Nano-Indenter at load range (0.4 mN – 1000 mN) (data only), Sample size : 25x25 mm by t (micron) [t-film thickness]	8260.00
46.	Nanohardness of thin films using Nano-Indenter at load range (0.4 –1000 mN) along with load depth plots, Sample size : 25x25 mm by t (micron) [t-film thickness]	10384.00

47.	Nanohardness of ceramic coatings using Nano-Indenter at load range (0.4 mN – 1000 mN) (data only), Sample size : 25x25 mm by t (micron) [t-film thickness]	8260.00
48.	Nanohardness of ceramic coatings using Nano-Indenter at load range (0.4 mN – 1000 mN) along with load depth plots, Sample size: 25x25 mm by t (micron) [t-film thickness]	10384.00
49.	Nanohardness of Glass using Hysitron triboindenter (0.01 $\mu$ N- 12,000 $\mu$ N) (data only), Sample size : 25x25x10 mm	15576.00
50.	Nanohardness of Glass using Hysitron triboindenter at load range of (0.01 $\mu$ N- 12,000 $\mu$ N) with indent's Scanning Probe Microscope (AFM) pictures, Sample size : 25x25x10 mm	18644.00
51.	Nanohardness of Glass using Hysitron triboindenter at loads in the range of (0.01 $\mu$ N-12,000 $\mu$ N) along with indent's Scanning Probe Microscope (AFM) pictures and load depth plots, Sample size : 25x25x10 mm	20650.00
52.	Nanohardness of Bulk ceramics using Hysitron triboindenter at load range (0.01 $\mu$ N-12,000 $\mu$ N) (data only), Sample size : 25x25x10 mm	15576.00
53.	Nanohardness of Bulk Ceramics using Hysitron triboindenter at load range of (0.01 $\mu$ N-12,000 $\mu$ N) with indent's Scanning Probe Microscope (AFM) pictures, Sample size : 25x25x10 mm	18644.00
54.	Nanohardness of Bulk Ceramics using Hysitron triboindenter at load range of (0.01 $\mu$ N-12,000 $\mu$ N) along with indent's Scanning Probe Microscope (AFM) pictures and load depth plots, Sample size : 25x25x10 mm	20650.00
55.	Nanohardness of thin films using Hysitron triboindenter at load range (0.01 $\mu$ N- 12,000 $\mu$ N) (data only), Sample size : 25x25 mm by t (micron) [t-film thickness]	15576.00
56.	Nanohardness of thin films using Hysitron triboindenter at load range of (0.01 $\mu$ N- 12,000 $\mu$ N) with indent's Scanning Probe Microscope (AFM) pictures, Sample size : 25x25 mm by t (micron) [t-film thickness]	18644.00
57.	Nanohardness of thin films using Hysitron triboindenter at load range of (0.01 $\mu$ N- 12,000 $\mu$ N) along with indent's Scanning Probe Microscope (AFM) pictures and load depth plots, Sample size : 25x25 mm by t (micron) [t-film thickness]	20650.00
58.	Micro-Scratch Testing at 2-20 N load of Bulk Glass and Ceramics with only friction data at constant peak load, Sample size : 25x25x10 mm	8260.00
59.	Micro-Scratch Testing at 2-20 N load of Bulk Glass and Ceramics with only friction data at ramping load up to the peak load, Sample size : 25x25x10 mm	8968.00
60.	Micro-Scratch Testing at 2-20 N load of Bulk Glass and Ceramics with friction data and graphical data plots, Sample size : 25x25x10 mm	9322.00
61.	Micro-Scratch Testing at 2-20 N load of Bulk Glass and Ceramics with friction data and graphical data plots and optical pictures with scale bar, Sample size : 25x25x10 mm	10384.00
62.	Macro-Scratch Testing at 20-200 N load of Bulk Glass and Ceramics with only friction data at constant peak load, Sample size : 25x25x10 mm	10384.00
63.	Macro-Scratch Testing at 20-200 N load of Bulk Glass and Ceramics with only friction data at ramping load up to the peak load, Sample size : 25x25x10 mm	10974.00
64.	Macro-Scratch Testing at 20-200 N load of Bulk Glass and Ceramics with friction data and graphical data plots, Sample size : 25x25x10 mm	11446.00
65.	Macro-Scratch Testing at 20-200 N load of Bulk Glass and Ceramics with friction data and graphical data plots and optical pictures with scale bar, Sample size : 25x25x10 mm	12390.00

**\*\* Sample to be supplied in r/o Sl.23-65 above as flat, parallel, ground and polished on the surface to be notched / indented and / or scratched.**

**FIELD EMISSION SCANNING ELECTRON MICROSCOPY (FESEM)  
(AMMCD)**

Sl. No.	Name of the Test(s)	Sample Size & Volume/Quantity	Rate(s) per Sample(Rs.)
1.	High Resolution Micro structural analysis by Field Emission Scanning Electron Microscopy (FESEM SUPRA 35VP) (Including conducting coating & 6 nos. of micrographs). (FS)  SOFT COPY	Bulk: 2 x 2 x 0.5mm(min) 10 x 10 x 5mm (max) Powder: 100 mg.(min) 1 gm.(max)	9086.00    118.00
2.	Additional Micrographs (a package of 4) (FS-A)	-----	826.00

**EDAX Analysis  
(AMMCD)**

Sl. No.	Name of the Test(s)	Sample Size & Volume/Quantity	Rate(s) per Sample(Rs.)
1.	<b>Elemental Analysis by Energy Dispersive X-Ray Analysis (EDX) in SEM/FESEM/TEM</b> (Including conductive coating).	Same as SEM sample	7316.00
2.	Elemental Distribution Analysis EDX Line Scanning/ Dot Mapping in SEM / FESEM/TEM (Including conductive coating) (EDX-LS)	- Do -	9558.00

**XRD/ XRF (AMMCD)**

Sl. No.	Name of the Test(s)	Sample Size & Volume/Quantity	Rate(s) per Sample(Rs.)
1.	XRD Diffractogram <b>without</b> any analysis  Soft Copy	Min. 5gms. <b>Powder</b> or <b>Solid</b> sample/ <b>Thin Film</b> Length x Breadth x Width(cm) 2.5cm x 1.5cm x 0.5cm(Min.) 6 cm x 3 cm x 1cm(Max.)	1888.00    118.00
2.	XRD Diffractogram with <b>qualitative</b> phase analysis	- Do -	3186.00
3.	XRD Diffractogram with <b>quantitative</b> phase analysis	- Do -	
	(a) Sample containing less or equal to three phases (multi phase)		
	(b) Sample containing more than three phases (multi phase)		10384.00
4.	XRD Diffractogram with only amorphous phase quantification	Minimum 10 gms powder	6254.00
5.	Semi-Quantitative elemental analysis by X-Ray Florescence (XRF)	Minimum 8 gms powder	11446.00

## FUEL CELL & BATTERY DIVISION (FCBD)

Sl. No.	Name of the Test(s)	Sample Size & Volume/Quantity	Rate(s) per Sample(Rs.)
1.	Li-ion coin cell fabrication (2032 type) without powder processing or casting		1888.00
2.	Li-ion coin cell fabrication (2032 type) including powder processing and casting	Minimum 1 gm sample	3658.00
3.	Galvanostatic charge discharge (Range 6 V, 500 mA) Up to 3 cycles Up to 10 cycles Up to 50 cycles Up to 300 cycles		1888.00 5428.00 8968.00 18054.00
4.	Cyclic voltammetry (Limit 6 V, 1 A) Normal Scan ( $\geq 1$ m V/s) Slow Scan ( $< 1$ m V/s)		3658.00 5428.00
5.	Electrochemical impedance spectroscopy (Range 1 mHz to 100 kHz)		1888.00
6.	Other electrochemical tests		Rate on request



**GLASS DIVISION**  
**GLASS SCIENCE & TECHNOLOGY SECTION**

Sl. No.	Name of the Test(s)	Sample Size & Volume/Quantity	Rate(s) per Sample(Rs.)
1.	Generation of <b>Glass Annealing Curve</b> including <b>Co-efficient of linear thermal expansion, Dilatometric Softening Point, Strain Point</b> and <b>Annealing Point</b> .	6-8 mm (dia) x 25 mm length	71390.00
2.	<b>Co-efficient of linear thermal expansion</b> of Glass and supply of data with Curve including Dilatometric Softening Point.	6 mm $\phi$ , 25 mm length	5546.00
3	<b>Spectroscopic measurement</b> of overall transmission in <b>UV/Visible/NIR</b> .	25mm x 25mm x at actual thickness	5546.00
4	(a) Whether Sheet Glass or Float Glass	100mm x 100mm x at actual thickness	6372.00
	(b) <b>Thickness</b> of the Glass	At actual size and thickness. Sample should be flat	1652.00
5	Determination of <b>Density</b> of Glass	10mm cube - 20mm cube /rectangular block	2360.00
6	(a) at one <b>wavelength of light</b>	20mm x 20mm x 2mm	3257.00
	(b) at each additional Wavelength	20mm x 20mm x 2mm	1298.00
	(c) <b>Refractive index</b> ( $n_d$ ) and <b>Abbe number</b> ( $V_d$ )	20mm x 20mm x 2mm	5900.00
	(d) <b>Abbe number</b> ( $V_d$ ) only	20mm x 20mm x 2mm	5546.00
7.	<b>Polarization</b> test for toughened window glasses	100mm-200mm x 100mm-200 mm x at actual thickness	5546.00
8	<b>Softening Point</b> Test	5mm x 5mm x 3mm	6844.00
9	<b>Optical microscope</b> observation	20 -25mm x 20 -25mm x 2-5mm thick parallel optical polished surfaces	8260.00
10	<b>Residual Stress</b> test <b>Expert opinion</b> on the overall result(for 5 samples <b>Max.</b> )	50 - 150 mm x 50 – 150 mm x 50 -150 mm	8685.00 11198.00
11.	Samples for <b>Tempered or Toughening of opal glass</b> articles/transparent glass articles	As such product	23010.00
12	<b>Fabrication/ Sample preparation</b> charge wherever applicable	-----	1416.00
13.	<b>Thermal Shock Resistance</b>	As such product	23010.00
13.	<b>Expert Opinion</b>		4838.00

**MATERIAL CHARACTERIZATION AND INSTRUMENTATION DIVISION  
(MCID)**

Sl. No.	Name of the Test(s)	Sample Size & Volume/Quantity	Rate(s) per Sample(Rs.)
1.	<b>Co-efficient of linear thermal expansion</b> and supply of data with Curve, <b>Glass transition</b> , <b>Softening point</b> , etc. [DIN:51045, ASTM E 831-86] <b>RTE</b> , <b>TDA</b> -Thermal Dilatometer Analysis, <b>INST.:</b> NETZSCH make Dilatometer 402C. (i) Up to 1200°C (ii) Up to 1500°C (iii) Extra charge for cooling curve, if required	25 mm x 6-8 mm (dia)	3540.00 5192.00 1298.00
2.	<b>Differential thermal analysis (DTA):</b> [DIN: 51007, ASTM E 473-85] (i) Up to 1200°C (ii) Up to 1500°C (iii) Extra charge for cooling curve, if required	200 mg  10 micron (approxly)	4838.00 6018.00 1298.00
3.	<b>Thermo-gravimetric analysis (TGA):</b> [DIN: 51006, ASTM E 914-83] (i) Up to 1200°C (ii) Up to 1500°C (iii) Extra charge for cooling curve, if required	200 mg	4838.00 6018.00 1298.00
4.	Determination of <b>Specific heat:</b> [ASTM E 1269] <b>DSC</b> -Differential Scanning Calorimetry (i) Up to 1000°C (ii) Up to 1400°C (iii) Extra charge for cooling curve, if required	Powder: 200 mg Solid: 5.2 mm dia 0.25 - 0.5mm thick	6018.00 7198.00 1298.00
5.	<b>Particle Size Analysis (micron range)</b> using LASER Diffraction System [ISO:13320-1]	20 mg	5428.00
6.	(i) <b>Nano particle size</b> analysis by <b>DLS</b> (Dynamic Light scattering) (ii) <b>Zeta potential</b> and (iii) <b>Isoelectric point</b> determination	20 ml dispersed sol.	4720.00 4720.00 6254.00
7.	Determination of <b>Thermal Conductivity</b> (within 80°C) at single temperature point For Solid Sample only RT Powder/Paste sample any temperature within 80°C	Bulk sample(two nos of identical samples): Dia: 100mm., Height:20.5mm Liquid/paste sample: 80c.c. Powder samples: 25 c.c.	9794.00
8.	Determination of <b>carbon content</b> in sample (Carbon Analyser C 600 LECO, USA)	4 ml for solid sample	2124.00
9.	(i) <b>Surface area</b> measurement by <b>BET</b> method : [ASTM B 922-10] (ii) <b>Pore volume</b> and <b>Pore size</b> by <b>N2</b> gas adsorption	30 cc powder sample	4838.00 7198.00
10.	Measurement of <b>Density</b> of sample (any shape) by Gas Pycnometry	100 cm <sup>3</sup> volume	1534.00
11.	Analysis of gas/liquid by Gas Chromatography Mass Spectrometer ( <b>GCMS</b> )	2ml for liquid sample	3776.00
12.	Analysis of gas/liquid by Gas Chromatography (GC)	2 ml for liquid sample	2950.00

13.	<b>Pore size</b> distribution by mercury <b>Porosimeter</b> : [ASTM D 4284-07]	15 cc powder sample/ 6 mm x 3 mm x 4 mm of solid sample 20 to 25 pieces.	2950.00
14.	Determination of <b>Nitrogen</b> content in sample LECO TC 600 O <sub>2</sub> /N <sub>2</sub> determinator.	4 ml for liquid sample/ 4mm x 4 mm x 10 mm for solid sample	2124.00
15.	Determination of <b>Oxygen</b> content in sample	4 ml for liquid sample/ 4mm x 4 mm x 10 mm for solid sample	2124.00
16.	Evaluation of <b>Rheological Properties</b> of gels, pastes and other viscous substances. (i) Flow characterization (ii) Creep and relaxation analysis (iii) Thixotropic analysis (iv) Oscillation	50 ml 50 ml 50 ml 50 ml	3186.00 3186.00 3186.00 3186.00
17.	<b>Magneto-Rheology</b> (at 3 magnetic field values)	50 ml	4366.00
18.	Sample preparation charge as applicable against Sl. No.1, 6 & 10 above		1062.00

#### ANALYTICAL CHEMISTRY (MCID)

Sl. No.	Name of the Test(s)	Sample Size & Volume/Quantity	Rate(s) per Sample(Rs.)
1.	Quantitative chemical analysis of ceramic raw materials, finished products and industrial waste for determination of <b>09 constituents</b> : SiO <sub>2</sub> , Al <sub>2</sub> O <sub>3</sub> , Fe <sub>2</sub> O <sub>3</sub> , TiO <sub>2</sub> , CaO, MgO, Na <sub>2</sub> O, K <sub>2</sub> O and loss on ignition	Minimum 100g powdered sample	14278.00
2.	Quantitative chemical analysis by <u>wet chemical method</u> for determination of <b>each</b> of the following constituents (SiO <sub>2</sub> , Fe <sub>2</sub> O <sub>3</sub> , TiO <sub>2</sub> , CaO, MgO, PbO, BaO, SrO, ZnO, CdO, CuO, MnO <sub>2</sub> , Li <sub>2</sub> O, CoO, NiO, B <sub>2</sub> O <sub>3</sub> , SO <sub>3</sub> )	Minimum 50g powdered sample	2950.00
3.	Quantitative chemical analysis by <u>wet chemical method</u> for determination of <b>each</b> of the following constituents ( <b>Al<sub>2</sub>O<sub>3</sub>, ZrO<sub>2</sub>, Cr<sub>2</sub>O<sub>3</sub>, P<sub>2</sub>O<sub>5</sub></b> )	Minimum 50g powdered sample	5074.00
4.	Quantitative chemical analysis by <b>ICP AES</b> for determination of each element (Si, Al, Fe, Ti, Ca, Mg, Na, K, Li, Sr, Ba, Mn, Zn, Zr, Cu, Cr, Ni, Co, Mo, Pb, Cd, Pt, Pd, As, Sb, S, P)	Minimum 50g powdered sample	4130.00
5.	Quantitative chemical analysis by <b>AAS (Atomic Absorption Spectroscopy)</b> for determination of each element ( <b>Pb, Cd, As</b> )	Minimum 50g powdered sample	2950.00
6.	Quantitative chemical analysis by <b>UV-VIS Spectrophotometer</b> for determination of each element ( <b>Fe, Ti</b> )	Minimum 50g powdered sample	2950.00
7.	Quantitative chemical analysis by <b>Flame photometer</b> for determination of each element ( <b>Na, K, Li</b> )	Minimum 50g powdered sample	2950.00
8.	Quantitative chemical analysis of <b>Fluoride / Chloride</b> by <b>Ion selective electrode</b>	Minimum 50g powdered sample	2950.00
9.	Determination of <b>loss on ignition / ash content</b> of carbonaceous material / graphite	Minimum 50g powdered sample	2950.00

10	Grading of glass for <b>Alkalinity</b> as per IS : 2303-1994	Minimum 500g solid sample (not powdered)	4130.00
11	Determination of <b>Lead and Cadmium</b> extracted from Glazed Ceramic surfaces as per ASTM C 738-94 ( <b>Each element</b> )	Minimum 6 pieces of sample	4130.00
12.	Test for <b>Acid Resistance of bricks</b> as per IS:4860-1968	Minimum 500g solid sample (not powdered)	4130.00
13.	Chemical Analysis of Water i. pH measurement ii. Hardness test iii. TDS test iv. Arsenic by FI-HG-AAS v. Fluoride / Chloride vi. ICP AES analysis of each element (Si, Al, Fe, Ca, Mg, Na, K, Sr, Ba, Mn, Zn, Cu, Cr, Ni, Co, Mo, Pb, Cd, S, P)	Minimum 1 litre	1534.00 6608.00 3304.00 4130.00 1534.00 2006.00
14.	Chemical analysis of castable (Al <sub>2</sub> O <sub>3</sub> , Fe <sub>2</sub> O <sub>3</sub> , TiO <sub>2</sub> ,CaO)	Minimum 100g powdered sample	8378.00
15.	Quantitative chemical analysis of glass and Frit : SiO <sub>2</sub> ( <u>wet chemical method</u> ) : B <sub>2</sub> O <sub>3</sub> ( <u>wet chemical method</u> ) : Al <sub>2</sub> O <sub>3</sub> , Fe <sub>2</sub> O <sub>3</sub> , TiO <sub>2</sub> , CaO, MgO, Na <sub>2</sub> O,K <sub>2</sub> O (ICP AES Method, 7 x Rs. 1700.00)	Minimum 100g	2950.00 2950.00 14042.00 Total: 19942.00
16.	Quantitative chemical analysis of Silica Ramming mass and Rice Husk Ash : SiO <sub>2</sub> ( <u>wet chemical method</u> ) : LOI ( <u>wet chemical method</u> ) : Al <sub>2</sub> O <sub>3</sub> , Fe <sub>2</sub> O <sub>3</sub> , TiO <sub>2</sub> , CaO, MgO, Na <sub>2</sub> O,K <sub>2</sub> O (ICP AES Method, 7 x Rs. 1700.00)	Minimum 100g	2950.00 2950.00 14042.00 Total: 19942.00
17.	Quantitative chemical analysis of Fly Ash : SiO <sub>2</sub> ( <u>wet chemical method</u> ) : LOI ( <u>wet chemical method</u> ) : Al <sub>2</sub> O <sub>3</sub> ( <u>wet chemical method</u> ) : Fe <sub>2</sub> O <sub>3</sub> , TiO <sub>2</sub> , CaO, MgO, Na <sub>2</sub> O,K <sub>2</sub> O (ICP AES Method, 6 x Rs. 1700.00)	Minimum 100g	2950.00 2950.00 5074.00 12036.00 Total: 23010.00
18.	Quantitative chemical analysis of Magnesite : SiO <sub>2</sub> ( <u>wet chemical method</u> ) : LOI ( <u>wet chemical method</u> ) : MgO ( <u>wet chemical method</u> ) : Al <sub>2</sub> O <sub>3</sub> ,Fe <sub>2</sub> O <sub>3</sub> , TiO <sub>2</sub> , CaO, Na <sub>2</sub> O, K <sub>2</sub> O (ICP AES Method, 6 x Rs. 1700.00)	Minimum 100g	2950.00 2950.00 2950.00 12036.00 Total: 20886.00
19.	Sample preparation for chemical analysis		1298.00

## NON-OXIDE CERAMICS & COMPOSITES DIVISION (NOCCD)

Sl. No.	Name of the Test(s)	Sample Size & Volume/Quantity	Rate(s) per Sample(Rs.)
1.	<p><b>Control atmosphere sintering</b></p> <p><b>i)</b> Basic charge up to 1500°C, 1 hr. (Extra. Charge per hour)</p> <p><b>ii)</b> Basic charge between 1500°C-1800°C, 1 hr. (Extra. Charge per hour)</p> <p><b>iii)</b> Basic charge between 1800°C-2000°C, 1 hr. (Extra. Charge per hour)</p> <p><b>iv)</b> Basic charge between 2000°C-2200°C, (Max. 30 min hold)</p> <p><b>Atmosphere:</b> Argon/Nitrogen/<b>Vacuum:</b>(10<sup>-3</sup> torr)</p>	<p><b>Maximum Sample size:</b> 50mm dia. x 100 mm height</p>	<p>18998.00 1534.00 23836.00 2006.00 28556.00 2360.00 3658.00</p>
2.	<p><b>Hot pressing</b></p> <p>Temperature: 1700°C, <b>Presser:</b> 5 MPa (Extra. Charge per hour) <b>Atmosphere:</b> Argon/Nitrogen/ <b>Vacuum:</b> (10<sup>-3</sup> torr) Cost of Graphite die extra as per design</p>	<p><b>Maximum Sample size:</b> 70mm dia. x 50mm height</p>	<p>30916.00  2478.00</p>
3.	<p><b>Hot pressing</b></p> <p><b>Presser:</b> 35MPa <b>Atmosphere:</b> Argon/Nitrogen</p> <p><b>i)</b> Basic charge up to 1500°C, 1 hr. (Extra. Charge per hour)</p> <p><b>ii)</b> Basic charge between 1500°C-1800°C, 1 hr. (Extra. Charge per hour)</p> <p><b>iii)</b> Basic charge between 1800°C-2000°C, 1 hr. (Extra. Charge per hour)</p> <p><b>iv)</b> Basic charge between 2000°C-2200°C, 1 hr. (Extra. Charge per hour)</p>	<p><b>Maximum Sample size:</b> 170 mm dia. X 100 mm height</p>	<p>78352.00 6018.00 9322.00 7198.00 130626.00 12626.00 156704.00 23836.00</p>
4.	<p><b>Spark Plasma Sintering Furnace</b></p> <p>Pressure : 35MPa <b>Atmosphere:</b> Argon/Nitrogen/Vacuum <b>Sample Dia.</b> 20-30 mm</p> <p><b>i)</b> Basic charge up to 1500°C, 5 min.</p> <p><b>ii)</b> Basic charge between 1500°C-2000°C, 5 min.</p> <p><b>iii)</b> Basic charge between &gt;2000°C, 5 min. (Extra. Charge per 5 min holding)</p> <p><b>Sample Dia.</b> 60-80 mm</p> <p><b>i)</b> Basic charge up to 1500°C, 5 min.</p> <p><b>ii)</b> Basic charge between 1500°C-2000°C, 5 min.</p> <p><b>iii)</b> Basic charge between &gt;2000°C, 5 min. (Extra. Charge per 5 min holding)</p>	<p><b>Maximum Sample size:</b> dia. 80 mm and height 10 mm</p>	<p>13570.00 16284.00 17700.00 1416.00</p>

# REFRACTORY & TRADITIONAL CERAMICS DIVISION (RTCD)

## REFRACTORY

Sl. No.	Name of the Test(s)	Sample Size & Volume/Quantity	Rate(s) Per Sample(Rs.)
1.	<b>Sieve Analysis</b> as per IS : 1528 (Part – XIV) (a) Dry (b) Wet	1 kg material	2006.00 2832.00
2.	<b>Size tolerance</b> as per IS : 1528 (Part – X)	Minimum 30nos. or as desired by the party	708.00
3.	<b>PCE</b> (Pyrometric Cone Equivalent) as per IS:1528 (Part-I)	1 kg material	6372.00
4.	<b>RUL</b> (Refractoriness Under Load) as per IS:1528 (Part-II) (Sample preparation charge extra)	(2nos.) 50mm dia x 50mm height	6372.00
5.	<b>PLCR</b> (Permanent Linear Change after Reheating) as per IS:1528 (Part-VI): (a) Up to 1400oC for 5 hours (b) Above 1400oC and up to 1600oC for 5 hrs (Sample preparation charge extra)	(5 nos. of samples) 5" x 2" x 2"	9558.00 12390.00
6.	<b>Spalling resistance</b> test as per IS:1528 (Part-III) Prism method by air quenching up to 1000°C	(3 nos. of samples) 3" x 2" x 2" 50mm (dia) x 50mm (H)	13688.00
7.	<b>CCS</b> (cold Crushing Strength) as per IS:1528(Part-IV) (Sample preparation charge extra)	3" cube 5nos. of samples <b>or</b> std. size bricks	2006.00
8.	<b>MOR</b> (Modulus of rupture) as per IS: 1528 (Part-V) (Sample preparation charge extra)	160 x 40 x 40mm 5nos. of samples <b>or</b> std. size bricks	2006.00
9.	<b>Water Absorption / Apparent Porosity/ Bulk density/ Apparent Specific gravity</b> as per IS : 1528 (Part-VIII) (Sample preparation charge extra)	65 x 65 x 40mm 5nos. of samples <b>or</b> std. size bricks	2006.00
10.	<b>True density/Specific gravity</b> as per IS:1528 (Part-IX) (Sample preparation charge extra)	3nos. of samples <b>or</b> 100gm powder (150 micron)	2360.00
11.	<b>True porosity / Closed Porosity</b> as per IS:1528 (Part XV) (Sample preparation charge extra)	5nos. of samples 65 x 65 x 40mm	3894.00
12.	<b>Compressive strength / modulus of rupture</b> of monolithics and castables as per IS:10570: a. after 24 hrs. curing ... .. b. after 72 hrs. curing ... .. c. after firing at temp up to 1000oC (3 hrs) ... .. d. after firing at temp up to 1400oC (3 hrs) ... .. e. after firing at temp up to 1550oC (3 hrs) ... ..	3 kg sample for a particular temperature	2832.00 3304.00 7670.00 10974.00 12390.00
13.	<b>Firing</b> in electric furnace : a. up to 1000oC (5 hrs) ... b. up to 1400oC (5 hrs) ... c. up to 1500oC (5 hrs) ...	As desired by the party	6372.00 9558.00 9558.00
14.	<b>Abrasion Resistance/Abradability index</b> as per B.S. 1902 Part-1A	4nos. of samples (3" x 2" x 1")	3894.00
15.	<b>Hot MOR</b> (up to 1400°C) IS : 1528 (Part XX)		13688.00
16.	Static Cup Slag Resistance	-----	13688.00
17.	Testing in <b>Moh's Scale hardness</b>	Regular shape sample with good surface (Defect Free)	1534.00
18.	<b>Dry &amp; Fired Shrinkage</b> (each) ( <b>firing Charge extra</b> )		2006.00
19.	<b>Sample preparation</b> charge (Sl. 4-12 & 21 as applicable)	-----	1416.00
20.	Fabrication of <b>Castable Samples</b> (per sample)	-----	2360.00
21.	<b>Expert Opinion</b>		4838.00

## TRADITIONAL CERAMICS

Sl. No.	Name of the Test(s)	Sample Size & Volume/ Quantity	Rate(s) per Sample(Rs.)
1.	<b>Deviation</b> in the dimension of tiles as per IS 13630 (Pt 1)- 1993 reaffirmed 2003	Minimum. 10 nos	1180.00
2.	<b>Straightness</b> of sides of tiles as per IS 13630 (Pt 1)- 1993 reaffirmed 2003	Minimum. 10 nos	13806.00
3.	<b>Rectangularity of tiles</b> as per IS 13630 (Pt 1)- 1993 reaffirmed 2003	Minimum. 10 nos	2006.00
4.	<b>Surface Flatness</b> of glazed tiles as per IS 13630 (Pt 1)- 1993 reaffirmed 2003	Minimum. 10 nos	3658.00
5.	<b>Water Absorption</b> as per IS 13630 (Pt 2) / <b>Apparent Porosity/ Bulk density</b> (for fired samples)	Minimum. 5 nos	2006.00
6.	Firing Between 1000 <sup>0</sup> C to 1350 <sup>0</sup> C in electric furnace (one firing) and examination of fired characteristics like: Colour, Shrinkage, Water Absorption, Apparent Porosity and Bulk density	Size of the tiles: 6' x 6' and 8' x 8' (No of tiles max. four) on each cycle	12390.00
7(a)	Determination of <b>Moisture Expansion</b> using boiling water-unglazed tiles as per IS:13630 (Pt 3) - 1992	Minimum. 5 nos	2478.00
7(b)	Determination of Thermal shock resistance of tiles as per IS:13630 (Pt 5) – 1992 + water Absorption (must)	Minimum. 5 nos	2124.00 +2006.00
8.	<b>Crazing Resistance</b>		
	i) Tiles as per IS 13630 (Pt.9) 2006	Minimum. 5 nos	3540.00
	ii) Sanitary ware as per IS 2556 – 1994/2004	Minimum. 5 nos	4366.00
	iii) Fine Bone China 5kgf/cm <sup>2</sup> for 2 hrs(5 cycles)	Minimum. 5 nos	4366.00
9.	<b>Burnt Clay Building Bricks as per IS - 3495:1992</b>		
	i) Water Absorption (Pt - 2)	Minimum. 5 nos	2124.00
	ii) Efflorescence (Pt - 3)	Minimum. 5 nos	3658.00
	iii) Warpage (Pt - 4)	Minimum. 5 nos	3658.00
<b>Test detail of various types of ceramic bodies</b>			
10.	<b>Grit Content</b>		826.00
11.	<b>Water of Plastisity</b>		1416.00
12.	<b>Water Absorption, Apparent Porosity, Bulk density</b> with fabrication of bar and one firing upto 1300 <sup>0</sup> C (Max) (Single mix up to 24 hrs. grinding/ max. ten samples or 1 kg. batch)	Single mix upto 24 hrs. grinding/ max. ten samples or 1 kg. batch	10148.00
13.	<b>Atterbeg Number</b>		944.00
14.	<b>Dry &amp; Firing Shrinkage</b> with fabrication of bar and one firing upto 1300 <sup>0</sup> C (Max)	Single mix upto 24 hrs. grinding/ max. ten samples or 1 kg. batch	9676.00
15.	<b>Expert Opinion on types of Tiles/Bricks</b>		4838.00