TESTING FACILITY AT CSIR NML

List of testing facilities

CSIR-NATIONAL METALLURGICAL LABORATORY
Jamshedpur-831007

Testing Facilities

Applied and Analytical Chemistry (AAC) Division

S. No.	Description	Relevant Standard	Unit
AC 1	Ash Fusion Temperature (ore/mineral)		Per Sample
AC 2	Ash + Moisture (coal sample)		Per Sample
AC 3	Moisture (coal sample)		Per Sample
AC 4	Moisture(Equilibrated Basis) (coal sample)		Per Sample
AC 5	Ash (coal sample)		Per Sample
AC 6	Coal Sample Preparation (Above 72 Mess)		Per Sample
AC 7	Proximate (as received basis) (coal sample)		Per Sample
AC 8	Proximate (Dry Basis) (coal sample)		Per Sample
AC 9	Proximate(Equilibrated basis) (coal sample)		Per Sample
AC 10	Gross Calorific value (GCV) (as-received basis) (coal sample)		Per Sample
AC 11	Gross Calorific value (GCV) (Equilibrated basis) (coal sample)		Per Sample
AC 12	Gross Calorific value (GCV) (coal sample)		Per Sample
AC 13	Ash Composition (Fe_2O_3%, SiO_2 (%), Al_2O_3(%), CaO(%), MgO(%), TiO_2(%), MnO(%), P_2O_5 (%), SO_3(%),Na_2O (%), K_2O(%) any additional radical analysis charge (Rs. 1,000/-) per radical (rare earth is not included) (coal sample)		Per Sample
AC 14	Ultimate Analysis(coal sample)		Per Sample
AC 15	Total Sulphur Analysis (coal sample)		Per Sample

AC 16	Sulphur Speciation (coal sample)		Per Sample
AC 17	Ash Fusion Temperature (coal sample)		Per Sample
AC 18	Swelling Index (coal sample)		Per Sample
AC 19	Caking Index (coal sample)		Per Sample
AC 20	HGI (coal sample)		Per Sample
AC 21	LTGK Coke Type (coal sample)		Per Sample
AC 22	Rear Earth analysis in Coal/Coal ash/ Fly ash(14 radical)		Per Sample
AC 23	Gross calorific value, Ash & moisture(All on equilibrated basis at 60% R.H and 40°C) (For > 3.35mm sample size)		Per Sample
AC 24	Gross calorific value, Ash & moisture (All on equilibrated basis at 60% R.H and 40°C) (For > 3.35mm sample size) Additional of Rs. 300/- per samples may be charge, if sample size more than 212 micron		Per Sample
AC 25	First four elements or less		Per sample
AC 26	For every subsequent element		Per radical Per sample
AC 27	Complete analysis by direct emission spectrograph		Per sample
AC 28	XRF		Per 10 radical or less per sample
AC 29	XRF		Additional radical
AC 30	Hydrogen, Oxygen & Nitrogen in Metal		Per gas per sample
AC 31	Water sample (Colour, PH, Conductivity, Acidity/alkalinity, Total dissolved solids, Total Hardness, Turbidity, Chloride, Iron, Calcium, Magnesium, Manganese, Zinc, Fluoride, Nitrate, Sulphate, Bromide, Phosphate, Iodide, Nitrite,		Per 10 parameter per sample

	Nickel, Chromium, Lead, Cadmium, Copper, Cobalt, aluminium, Molybdenum, Barium, Ammonium, Sodium, Potassium, Lithium)		
AC 32	Additional radical (water sample)		Per Sample
AC 33	Special test for element like Arsenic antimony, tellurium, selenium, mercury, hydride generation		Per radical per sample
AC 34	Speciation analysis: (i) As(III) and As(V) in water (ii) Se (IV) and Se (VI) in water		Per sample
AC 35	Trace Metal analysis by ICP-Mass		Per sample for first 5 radical
AC 36	Additional radical by ICP-Mass		Per radical /sample
AC 37	Testing of rear earth elements including Y, Sc, Ge, Ga		Per radical
AC 38	Testing of precious metals (Au, Ag, Pd, Pt, Ir)		Per radical
AC 39	Testing of 14 rare earth element (REE) and Sc, Y		Per Sample
AC 40	Gaseous Standards in Steel : C & S in Steel (CRM 504) (Pin Shape)		100 Gm Pack
AC 41	CSR/CRI Analysis of Coke sample		Per sample
AC 42	Mercury Analysis in solid, liquid and gaseous samples		Per sample
AC 43	CAST IRON (CRM No. 201.8) (Turning form)		100 Gm Pack
AC 44	ALLOY CAST IRON (CRM No. 207.3) (Turning form)		100 Gm Pack
AC 45	STEEL 0.10 % C (CRM No. 213) (Turning form)		100 Gm Pack
AC 46	STEEL 0.48 % C (CRM No. 214) (Turning form)		100 Gm Pack
AC 47	STEEL 1 % C STEEL (CRM No. 215) (Turning form)		100 Gm Pack
AC 48	STAINLESS STEEL (CRM No. 220) (Turning form)		100 Gm Pack

AC 49	LOW ALLOY STEEL (CRM No. 223.6 A)(Turning form)		100 Gm Pack
AC 50	BRASS 60:40 (CRM No. 241) (Turning form)		100 Gm Pack
AC 51	BRASS 70:30 (CRM No. 242) (Turning form)		100 Gm Pack
AC 52	6% Si-Al ALLOYS (CRM No. 251.1) (Turning form)		100 Gm Pack
AC 53	Gaseous Standards in Steel: C & S in Steel (CRM 505) (Pin Shape)		100 Gm Pack
AC 54	Gaseous Standards in Steel: H ,N& O in Steel (CRM 506) (Pin Shape)		100 Gm Pack
AC 55	L.C. Fe-CHROMIUM (CRM No. 229) (Powder form)		100 Gm Pack
AC 56	H.C. Fe-CHROMIUM (CRM No. 230) (Powder form)		100 Gm Pack
AC 57	Fe-SILICON (CRM No. 231) (Powder form)		100 Gm Pack
AC 58	Fe-MOLYBDENUM (CRM No. 232) (Powder form)		100 Gm Pack
AC 59	L.C. Fe-Manganese (CRM No. 233.1) (Powder form)		100 Gm Pack
AC 60	Gaseous Standards in Steel: H ,N& O in Steel (CRM 507) (Pin Shape)		100 Gm Pack
AC 61	Fe-TITANIUM (CRM No. 234) (Powder form)		100 Gm Pack
AC 62	Fe-VANADIUM (CRM No. 235) (Powder form)		100 Gm Pack
AC 63	BLAST FURNACE SLAG (CRM No. 435.2) (Powder form)		100 Gm Pack
AC 64	Plain Carbon Steel (CRM No.304A)(Disc Form)		For each piece
AC 65	IRON ORE (CRM No. 161.4 A) (Powder form)		100 Gm Pack
AC 66	IRON ORE (CRM No. 161.5 A) (Powder form)		100 Gm Pack
AC 67	IRON ORE (CRM No.161.6 A) (Powder form)		100 Gm Pack
AC 68	MANGANESE ORE (CRM No.166.3 A) (Powder form)		100 Gm Pack
AC 69	MANGANESE ORE (CRM No.166.4 A) (Powder form)		100 Gm Pack

AC 70	LIME STONE (CRM No.172) (Powder form)		100 Gm Pack
AC 71	STEEL 0.6 % C Steel (CRM No. 216) (Turning form)		100 Gm Pack
AC 72	STEEL 0.4 % C Steel (CRM No. 217) (Turning form)		100 Gm Pack
AC 73	Mean Maximum Reflectance (MMR)% of Coal		Per Sample
AC 74	Mean Random Reflectance (MRR)% of Coal		Per Sample
AC 75	Coke Making using 7 kg Coke oven furnace		Per Sample
AC 76	Petrographic analysis of coal, Maceral Analysis (Vitrinite%, Inertinite%,Lipinite% and Mineral Matter % including V type distribution)		Per Sample
AC 77	STAINLESS STEEL (CRM No. 303) (Disc Form)		for each piece
AC 78	STAINLESS STEEL (CRM No. 301) (Disc Form)		for each piece
AC 79	STAINLESS STEEL (CRM No. 302) (Disc Form)		for each piece

Advance Materials & Corrosion (AMC) Division

S. No.	Description	Relevant Standard	Unit
AM 1	FTIR spectra Range: 400-4000cm-1, Sample type: solid powder or liquid		Per sample
AM 2	UV-visible spectra (liquid sample only, 200-900nm)		Per sample
AM 3	Vacuum Arc Melting (up to 200 grams)		Per sample
AM 4	Nano-indentation		Per sample
AM 5	BET surface area only		Per sample
AM 6	Complete BET analysis including BET surface area , mesopore size distribution, pore volume and average pore diameter		Per sample
AM 7	Contact Angle Measurement (at room temp. to60^{o}C)		Per sample
AM 8	Melt Spinning (up to 200 grams)		Per sample

AM 9	Wire Casting by in-water quenching(up to 5 gm)		Per sample
AM 10	AC Core loss measurement system (thin strip, Toroid , Epstein frame)		Per sample
AM 11	Hardness tester (Model VH-50D,Digital Automatic Turret Vickers)		Per sample
AM 12	Magnetic characterization system for amorphous alloy ribbons		Per sample
AM 13	Optical Stereo Microscope (10x to 80x)		Per sample
AM 14	Magnetic hysteresis loop using surface probe (MagStar)		Per hour
AM 15	Magnetic Barkhausen emissions using surface Probe (MagStar)		Per hour
AM 16	B-H. Loop & determination of Coercive force maximum permeability using ring specimen OD=30mm,ID=20mm,thickness=5mm		Per sample Per Temperature
AM 17	Optical Microscope (50x to 1000x) & Image analysis		Per sample
AM 18	Thermal Conductivity Measurement System (RT To 500^{o}C) (500^{o}C to 950^{o}C)		Per sample
AM 19	High Temperature Nano-indentation (Nano Indenter G200)(RT to 500^{o} C)(100-450^{o}C)		Per sample
AM 20	Temperature variation of electrical resistivity (Room temp to 1000^{o}C) Sample dimension:100mmx2mmx2mm		Per sample Per Temperature
AM 21	Temperature variation of electrical resistivity (193^{o}Cto 150^{o}C) Sample dimension:100mmx2mmx2mm		Per sample Per Temperature
AM 22	Differential scanning calorimetry (DSC) from RT to 700^{o}C		Per sample
AM 23	Specific heat up to 500^{o}C using Differential Scanning Calorimeter (DSC)		Per sample
AM 24	Raman Spectroscopy		Per sample

Engineering (ENG) Division			
S. No.	Description	Relevant Standard	Unit
EN 1	Code & heat-treatment (Heat treatment to diffuse hydrogen out of weld test pieces)		Per charge (Max. Charge size 100mmx250mmx250mm)
EN 2	Coating moisture test (loss in wt. At 120°C for 30 minutes)		Per test
EN 3	Welding electrode evaluation: mechanical property, chemical Analysis of weld metal, hardness bend test.	AWS/ ASME/ IS Codes	Per Electrode
EN 4	Welding filler evaluation: mechanical property, chemical analysis of weld metal, hardness, bend test	AWS/ ASME/ IS Codes	Per filler
EN 5	Friction Stir Welding of light metals (Aluminium, Magnesium, Copper		Per day
EN 6	Bend test		Per Sample
EN 7	Diffusible Hydrogen in welds		Per Sample
EN 8	EDM wire cutting services		Per Hour
EN 9	Optical Imaging using Stereo Microscope		Per Sample
EN 10	High Speed Imaging using high speed camera (up to 5,00,000 fps)		Per Hour
EN 11	Weld Procedure qualification as per ASME Sec IX, ISO		Per test plate
EN 12	Welder Qualification as per ASME Sec IX, ISO		Per test plate
EN 13	Twin wire submerged arc welding system (SWA)		Per Day
EN 14	Sample test plate welding (Carbon steel as per customer requirement		Per Sample
EN 15	Coordinate Measuring Machine (CMM)for inspection & reverse engineering	As per customer requirement	Per day

EN16	Robotic MIG (for additive manufacturing etc.)	As per customer requirement	Per day
EN17	Cold metal transfer GMAW and Pulse GMAW by Robotic MIG	As per customer requirement	Per day
EN18	Pulse TIG welding	As per customer requirement	Per day
EN19	Surface roughness tester	As per customer requirement	Per Sample
EN20	Profile projector	As per customer requirement	Per hour
EN21	Inspection of specimens	As per drawing	Per sample

Metal Extraction & Recycling (MER) Division

S. No.	Description	Relevant Standard	Unit
ME 1	Air Jet Erosion test at Room Temperature		Per sample per hour (Max. 3 readings)
ME 2	Air jet erosion at 50°C-500°C		per sample per hour (Max
ME 3	Nano-tribimeter		per sample per hour
ME 4	Vacuum Induction melting Up to 40 Kg/ heat		Per Heat
ME 5	Vacuum Induction melting Up to 20 Kg/heat		Per Heat
ME 6	Vacuum Induction melting 200gm- 2Kg/ heat		Per Heat
ME 7	Air melting		5 - 20 Kg Per Heat
ME 8	Arc Furnace melting (50 KVA)		Upto 30Kg Per Heat
ME 9	Submerged Arc melting 50 KVA		Upto 30KgPer Heat
ME 10	Submerged Arc melting 175KVA		Upto 300Kg Per Heat
ME 11	Softening Melting		Per Test
ME 12	Reducibility Index (RI)		Per Sample

ME 13	Reducibility Degradation Index (RDI)		Per Sample
ME 14	Thermal Degradation Index (TDI)		Per Sample
ME 15	Decrepitation of lime		Per Sample
ME 16	Bend Test		Per Set of sample (3 Numbers)
ME 17	Flattering Test		Per Set of sample (3 Numbers)
ME 18	Compression Test		Per Set of sample (3 Numbers)
ME 19	Viscosity Measurement		Per Sample
ME 20	Swelling Test		Per Sample
ME 21	Isothermal conduction calorimetry		Per Sample(27^{o}C)
ME 22	Resistance heating furnace with lifting hearth or bottom loading furnace (Tmax=1600^{o}C		Per Heat
ME 23	Inverse mound simulator for continues casting simulation		Per Heat

Mineral Processing (MNP) Division			
S. No.	Description	Relevant Standard	Unit
MN 1	Mineral Characterisation (Identification only)		Per sample per hour (Max. 3 readings)
MN 2	Mineral Characterisation (only Optical Microscopy)		per sample per hour (Max
MN 3	Mineral Characterisation (Optical microscopy, liberation)		Per Sample
MN 4	Mineral Characterisation (Including XRD, SEM Etc)		Per Sample
MN 5	Carbon coating		Per Sample
MN 6	DTA & TG Analysis		Per Sample Up to 4 hours
MN 7	Bond's work index determination-Rod Mill		Per Sample
MN 8	Hard groove Grind ability Index (HGI)		Per Sample
MN 9	Settling tests		Per Sample
MN 10	Bond's work index determination-Ball Mill		Per Sample
MN 11	Heavy media test (3 diff. Densities up to 3.3)		Per Sample
MN 12	Wash ability Tests for Coal for one size range up to 0.5 mm		Per Sample
MN 13	Crushing strength- rocks		Per Sample
MN 14	size analysis (cyclizing)		Per Sample
MN 15	size analysis (instrumental- laser, 1 to 1000 micron)		Per Sample
MN 16	size analysis (200 mm to 325 mesh) dry or wet Screening		Per Set
MN 17	sample preparation only (10 mesh to 200 mesh, up to 500g)		Per Sample
MN 18	Sample preparation (200mm to 200 mesh, up to 500g)		Per Sample
MN 19	Bulk sample preparation after grinding (50 Kg)		Per Sample
MN 20	Tumbler test (Tumbler & Abrasive Index)		Per Sample
MN 21	Shatter test		Per Sample
MN 22	Grindability test		Per Sample
MN 23	Bulk density/Sp.Gr		Per Sample

MN 24	Zeta potential measurement (below 25 micron), ZPC		Per Sample
MN 25	Porosity measurement (Mercury)		Per Sample
MN 26	Surface tension Measurement (Liquid sample)		Per Sample
MN 27	Proximate analysis of coal		Per Sample
MN 28	Blaine No.		Per Sample
MN 29	Pellets CCS		Per Sample
MN 30	Briquette CCS		Per Sample
MN 31	Mineral/ Coal sample preparation for petrography		Per specimen
MN 32	Coal petrography : Identification of maceral vitrinite, inertinite, liptinite and mineral matter (without sub macerals) and percentage		Per sample
MN 33	Coal petrography : Random reflectance measurement		Per sample
MN 34	Proximate analysis		Per sample
MN 35	CSR-CRI		Per sample
MN 36	Maximum fluidity ddpm of coke by Gieseler Dilatometer DL4000		Per sample
MN 37	Gieseler Plasticity of coke by Plastometer PL4000		Per sample
MN 38	Air permeability Test		Per sample
MN 39	Swelling index of pellets		Per sample
MN 40	Grinding of mineral/ore by Planetary mill (1mm to -200 mesh, up to 25g sample)		Per sample of 25g
MN 41	Crushing mineral/ore lumps (50mm to -10 mesh , up to 10kg sample) by jaw Crusher/Roll crusher		Per sample of 10kg
MN 42	Coal petrography including RRM, MMR		Per sample
MN 43	Reducibility Index(RI)		Per sample
MN 44	Reducibility Degradation Index(RI)		Per sample
MN 45	Wet Magnetic separation at one intensity without sample preparation		Per sample(up to 5 kg)

Materials Engineering (MTE) Division			
S. No.	Description	Relevant Standard	Unit
MT 1	Salt spray test		Per sample up to 1000 hours. (Min. 5 samples)
MT 2	Exfoliation corrosion (EXCO) test for Aluminium alloys	G34-01 (2007)	Per sample (min. 5 samples)
MT 3	Exfoliation corrosion (EXCO) ASSET Test	ASTM G66-99	
MT 4	Intergranular corrosion susceptibility in stainless steels Oxalic acid etching	ASTM A262-pratice A	Per sample (minimum 5 samples)
MT 5	Intergranular corrosion susceptibility in stainless steels Ferric Sulphate- Sulphuric acid	ASTM A262- Practice B	Per sample (minimum 5 samples)
MT 6	Intergranular corrosion susceptibility in stainless steels Boiling nitric acid test	ASTM A262- Practice C	Per sample (minimum 5 samples)
MT 7	Intergranular corrosion susceptibility in stainless steels Copper sulphate- sulphuric acid	ASTM A262- Practice E	Per sample (minimum 5 samples)
MT 8	Intergranular corrosion susceptibility in stainless steels Copper sulphate- sulphuric acid	ASTM A262- Practice F	Per sample (minimum 5 samples
MT 9	Stress corrosion cracking test in boiling magnesium chloride		Per sample (min. 5 samples)
MT 10	Pitting and crevice corrosion resistance of stainless steels and related alloys by use of ferric chloride solution.	ASTM G48	Per sample (min. 5 samples)
MT 11	Measurement of degree of sensitization in stainless steel by Single loop electrochemical potentio-kinetic reactivation test	ASTM G108-94 (2018)	Per sample
MT 12	Measurement of degree of sensitization in stainless steel by double loop electrochemical potentiokinetic reactivation test method		Per sample

MT 13	Electrochemical Impedance	ASTM G106-89 (2010)	Per sample
MT 14	Measurement of Corrosion potential of Al- alloys.	ASTM G69-97	Per sample
MT 15	Evaluation of IGC resistance of Al-alloys	ASTM G110-92	Per sample
MT 16	Evaluation of IGC resistance of Al-alloys	ASTM G67-92 (NAMLT)	Per sample
MT 17	High temperature oxidation		Per sample (min 100 hour)
MT 18	Anodic/Cyclic polarization test	ASTM G5-94 (2011)	Per sample
MT 19	Electrochemical Impedance with time up to 10 days		Per sample
MT 20	Impact test on Notched Charpy at room temperature	ASTM E23	Per sample
MT 21	Impact test on Notched Charpy below RT and up to -50^{o}C	ASTM E23	Per sample
MT 22	Impact test on Notched Charpy at High temperature up to 100^{o}C		Per sample
MT 23	Hardness tests (Vicker/Brinell/Rockwell/Pyramid)		Per sample (5 readings)
MT 24	Tensile Test (At room temperature)	ASTM E8 M or equivalent	Per sample
MT 25	Tensile Test (At high temperature up to 750 ºC)	ASTM E8 M or equivalent	Per sample
MT 26	Tensile Test (At high temperature >750 ºC≤ 1000 ºC		Per sample
MT 27	K_{Ic} / CTOD test at RT	ASTM E 1820 or equivalent	Per sample
MT 28	J_{Ic} / J-R curve / CTOD-R curve test	ASTM E 1820 or equivalent	
MT 29	High cycle Fatigue test (Single stress value)	ASTM E 466 or equivalent	Per Hour
MT 30	Fatigue test(S-N curve generation) (20 specimens will be tested)	ASTM E 466 or equivalent	Per grade
MT 31	Low cycle fatigue at RT	ASTM E 606 or equivalent	Per sample
MT 32	Low cycle fatigue up to 500^{o}C	ASTM E 606 or equivalent	Per sample
MT 33	FCGR at RT	ASTM E 647 or equivalent	Per sample
MT 34	Creep Test Stress rupture test up to 700 ºC	ASTM 139 or equivalent	Per sample per 1000 hrs

MT 35	Creep test up to 700 ºC	ASTM 139 or equivalent	Per sample per 1000 hrs
MT 36	Creep or stress rupture test above 700 ºC (Max.1100 ºC)	ASTM 139 or equivalent	Per sample per 1000 hrs
MT 37	Metallography Examination of microstructure and macrostructure including cutting, grinding and preparing the specimen and interpretation of results with photograph		Per sample
MT 38	Metallography (quantitative)		Per sample
MT 39	SEM - EDS		Per sample
MT 40	SEM - EBSD		Per sample
MT 41	SEM-In-situ Deformation/Tensile up to 2kN		Per sample
MT 42	X-ray diffraction for normal 2 deg./m diffractogram (without interpretation)		Per sample
MT 43	Quantitative phase analysis XRD		Per sample
MT 44	Residual stress by XRD		Per sample per spot
MT 45	TEM examination plus EDAX micro-analysis with ample preparation		Per sample
MT 46	AFM		Per sample upto 3 hour
MT 47	EPMA (WDX/EDX)		Per hour
MT 48	Mechanical processing in hot rolling with salt bath treatment		Per Sample
MT 49	Mechanical Processing in Forging (Hot Material)		Per sample
MT 50	Mechanical Processing in Cold Rolling		Per sample
MT 51	Mechanical Processing in Hot Rolling		Per sample
MT 52	Mechanical Processing in Wire drawing M/C (Bench Draw) Wire drawing M/C		Per sample
MT 53	Heat treatment (upto1000 ^{o}C up to 8 hr)		Per sample
MT 54	Heat treatment (1000-1200 ^{o}C up to 8 hr)		Per sample
MT 55	Salt bath heat treatment (220 ^{o}C to 650 ^{o}C for 8 hrs		Per Sample

MT 56	Sheet Metal forming test (Erichsen cupping test tool No. 21)		Per Sample
MT 57	Sheet Metal forming test (Deep drawing cup test)		Per Sample
MT 58	Sheet Metal forming test(hole expansion test)		Per Sample
MT 59	Sheet Metal forming test(Nakajima test for FLC)		Per FLC
MT 60	Hot Dip process simulator (HDPS) Test galvanizing test		Per day(max 20 Sample)
MT 61	Hot Dip process simulator (HDPS) Test galvannealing test		Per day(max 20 Sample)
MT 62	New Rolling Mill (Cold Rolling) Input Thickness: 7mm (max) Input Width:120 mm (max)		Per Sample
MT 63	New Rolling Mill (Hot Rolling)Input Thickness: 70mm (max) Input Width: 100 mm (max)		Per Sample
MT 64	Ultrasonic flaw detection		Per hour
MT 65	Ultrasonic thickness measurement		Per Spot
MT 66	Ultrasonic C-Scan measurement		Per specimen per hour
MT 67	Modulus of elasticity measurement by Ultrasonic		Per specimen
MT 68	Ultrasonic flaw detection by TOFD		Per hour
MT 69	Ultrasonic flaw detection by Phased array		Per hour
MT 70	ED Current Testing		Per Sample
MT 71	Thermal Imaging Using Thermography System		Per Sample