

CSIR-NML Procurement Plan for 3-5 Years

Equipment

Table top scanning electron microscope
Universal surface tester (micro hardness, elastic modulus, scratch, corrosive wear, 3D imaging)
2 Channel/ BiPotentistate/ Galvanostat and high temperature cell
Micro Arc Oxidation (MAO/Plasma Electrolytic Oxidation(PEO) system
Humidity Test Chamber
High temperature electrochemical cell with multichannel Potentiostat/Galvanostat
High temperature erosion-corrosion test rig
2 Stage Air Classiifier for separation of metal powder
Sieving system + Range powder testing appratus
Ultrasonic vibration based Sieving system + Range powder testing appratus
Other metal additive manufacturing facility
SSRT with high temperature and high pressure hydrogen gas environment test
Ultrasonic shot peening
Potentiostat/ Galvanostat
Arc Furnace (500gms in FE equivalent) progressing in HCP0030WP2
Vacuum oven progressing in HCP0030WP2
Ball milling in the proposed project
High-temperature furnace (up to 2200 °C) in the proposed project
vacuum glass sealing equipment
Generator of liquid nitrogen plant
Metallography Equipment
Thermal Desorption Spectrometer to quantify hydrogen trapping capacity
Plama Cleaner for EBSD and TEM sample preparation
Dimple Grinder for TEM sample preparation
Disc Grinder for TEM smaple preparation for brittle samples
Ultrasonic Disc Cutter
Cross-section Kit for TEM sample preparation of coatings, thin films etc.
Cold FEG Analytical TEM with EDS
FIB with EDS, STEM and Nano pillar compression
Generator of liquid nitrogen plant
Metallography Equipment

PID controller (i.e., temperature controller) along with thyrister for 20 sets.
PC based controller for 50 Ton MTS machine
Portable X-Ray residual stress measurement unit
2-3 Xeon gold 80 core computers
X-ray diffractometer for both powder and thin films specimens including the facility for residual stress, crystallographic texture and X-ray reflectivity measurements
high energy ball milling machine' having the facility of ball milling of materials under controlled atmosphere (preferably Argon and nitrogen atmosphere) with high purity tungsten carbide balls and jars
Upgradation of 500kN MTS make servo-hydraulic uniaxial test system
Upgradation of INSTRON make servo-hydraulic uniaxial test system: 03 Nos
Hydraulic Power Pack 90LPM
Impedance analyser 100 kHz to 300 MHz
High power ultrasonic system
Nano-CT
Laser ultrasonic system
Electrochemical Workstation (PGSTAT)
Computer Controlled Measurement and Monitoring of Temperature, pH , Dissolved Oxygen sensor and unit
Cavitation Erosion Tester
Slurry Jet Erosion Tester
High Temperature Wear Tester
Hybrid Low-Velocity Oxy Fuel Coating (< 200 μm) system
Solar Simulator
Tubular Furnace
Magnetron Source (Sputter Gun) for Sputtering System
Vibrating Sample Magnetometer
Power Source for Lakeshore Electromagnet
Battery cycler
Conventional Lathe machine
CNC Lathe machine
Universal Milling machine
Surface Grinding machine
Portable Plasma Cutter
Graphite Electrode Brazing machine
CNC Turn-mill machine(5-axis)

Tool & Cutter machine
Cylindrical Grinding machine
Portable Hardness Testing machine
Automatic Broach machine with broach set
Rebar corrosion detector and resistivity meter
Coating thickness measurement system – EDXRF based
X-ray Fluorescence Spectrometer (XRF)
Multichannel Battery Tester with EIS
Spark emission spectrometer (OES) of Fe, Cu, Pb & Zn base
Low Speed/RPM lath machine
Automatic abrasive cutter/ machine having minimum/maximum size 10mm to 120mm with coolant facility
Carbon & Sulphur Determinator
Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES)
Ultrapure Water Purification System
Sample preparation unit for petrography and coal sample(Coal & Rocks)
Coal Microscope
Bomb Calorimeter (2 nos)
Proximate Analyser (TGA)
UV-Vis Spectrophotometer
Vibratory Cup Mill
Single-Position Glove Box with purification system
Tube furnace ≥ 1400 °C Temp.
Muffle Furnace ≥ 1400 °C Temp.
Muffle Furnace 1200 °C (2 nos)
High Performance Liquid Chromatography (HPLC)
ICP-MS
GC-MS (Gas Chromatography with Mass Spectrometer)
Particle size analyser (Micron size) for solid and liquid
TGA/DTA
Tablet Making Instrument
Micro Balance, Roll crusher, Humidity Chamber, Water distillation unit, UPS, Batteries, Computers
Flame Photometer
pH, conductivity, TDS meter (potable, carryable to field)

BOD incubator
Orbital Shaker
Fluoride ion selective electrode
Dissolved oxygen analyser
Turbidity meter
Cyanide distillation assembly
Cyanide ion selective electrode
COD digestion assembly
Vacuum filtration unit with pump
Hydrothermal reactor (Small, Medium, and large)
Magnetic stirrer with Hot plate
High Vacuum pump
Hot plate
Hot Air Oven
Scientific Balance
pH Meter
Conductivity meter
Micropipette
Fuming hood
Air Compressor
Planetary Vacuum Mixer
Automatic Film Coating Machine with dryer
Hot Rolling Press Machine
Manual Disk Punching Machine for Coin Cell
Coin Cell Electric Crimping Machine
Vacuum Drying Oven
Multichannel charge/discharge battery testing systems
Rotary Kiln
Electric Arc Furnace
Multistage Leaching setup with filtration accessories
ICP-OES
HAMMER AND VIBRATORY CUP MILL
ASPEN SOFTWARE 5 YEAR LICENSE

ISOTHERMAL CONDUCTION CALORIMETRY
TG-DTA compatible with corrosive gases (CO,H2, CO2)
Handheld XRF
Laser Diffraction Particle Size Analyser
C-MS (Gas chromatography/analyzer with Mass Spectroscopy)
High temperature Potentionstat for fused salt electrolysis
High temperature vacuum induction arc melting furnace
Upgradation of Vacuum Induction Furnace Panel (capacity: 40 kg)
Ladle operations set up with lancing, gas purging, heating, alloying and vacuum treatment at 20 Kg scale
High temperature viscometer
Electrically Heated Rotary Kiln Furnace
High temperature high vacuum furnace of 1 Kg capacity
Modular LED Wall 18'x10' for Auditorium
Projector for Lecture Hall /Auditorium/Committee Room/DJ Hall
Display for Dias at auditorium
Camera for Youtube Streaming
Controller Console with KB for Youtube
Unified Threat Management Device(UTM)
NG Firewall
3KVA UPS 5 Nos
NVR 3 Nos
Fusion Splicer
OTDR
Optical Power Meter
Two compute node for High performance computing cluster (HPC) and AMC
ANSYS software upgradation and HPC license
MICRESS upgradation and HPC license
MATLAB upgradation and HPC license
Pneumatic forging hammer with 0.5-ton capacity
X-ray Fluorescence Spectrometer (XRF)
Carbon & Sulphur Determinator
Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES)
Coal Microscope

Bomb Calorimeter (2 nos)
Proximate Analyser (TGA)
MATLAB Upgradation
Fusion bead machine for sample preparation of ICP-OES and XRF
Spark emission spectrometer (OES) of Fe, Cu, Pb & Zn base
Particle size analyser (Micron size) for solid and liquid
Sample preparation unit for petrography and coal sample(Coal & Rocks)
Scanning Electron Microscope with SE, BSE, EDS, WDS, CLD-spectroscopy, correlative petrological microscope, Software for automated phase identification, phase quantification, liberation analysis, image analysis, grade-recovery analysis, with suitable EPMA mineral/metal standards for calibration for phases of REE, PGE, gold, silicate, oxides, sulphides, metals, ferrites etc. in rock, ore, metallurgical products etc., software for phase quantification of ores, silicates, slag, sinter/pellet products
Cyclosizer
Mixer setter units (bench scale and semipilot scale)
Rotary Kiln
Electric Arc Furnace
Multistage Leaching setup with filtration accessories
ICP-OES
ASPEN SOFTWARE 5 YEAR LICENSE
ISOTHERMAL CONDUCTION CALORIMETRY
TG-DTA compatible with corrosive gases (CO, H ₂ , CO ₂)
Handheld XRF
Laser Diffraction Particle Size Analyser
SOPAT, smart online particle size analyser
Potentiostat/ Galvanostat
Table top scanning electron microscope with EDS
Humidity Test Chamber
SSRT machine for SCC & Corrosion fatigue at high temperature and high pressure water environment
SSRT machine for SCC & Corrosion fatigue under high temperature and high pressure H ₂ gas environment
2 stage air classifier for separation of metal powders
Ultrasonic sieve shaker with range of sieves
Electrochemical Workstation (PGSTAT)
Computer Controlled Measurement and Monitoring of Temperature, pH, Dissolved Oxygen sensor and unit
Cavitation Erosion Tester

Slurry Jet Erosion Tester
Power Source for Lakeshore Electromagnet
Magnetic stirrer (02Nos.)
Battery cycler
Fuel Cell fabrication facility
FBG Interrogator
Laser Source for IR thermography
Tubular Furnace
Solar Simulator
Software Upgradation for XP nanoindenter system
Modernisation of Metallography Laboratory
Analytical Transmission Electron Microscope with EDS
Plasma Cleaning Kit for EBSD and TEM sample preparation
Dimple Grinding Unit for TEM sample preparation
Cross-section Kit
Ultrasonic Disc Cutting and disc grinding unit
ICDD data license (5 years)
Arc Furnace 500 gms Fe equivalent
Vacuum oven upto 500 deg C
High temperature vacuum furnace upto 2200 deg c
Vacuum glas sealing equipment
Induction Coil
AFM
HR-XRD machine for powder and thin films along with stress, texture and XRR measurements facility. Also the primary and the secondary optics must be having the most advanced technology (if possible with the 2D detector at the secondary, if fund permits)
High energy ball milling machine with controlled atmosphere milling facility for nanoparticles synthesis
Equipment for Fronius TPS500i robotic welding machine
(a) Data logger for measurement of temperature and current –voltage transient
(b) Welding current and voltage measurement device
Upgradation of 500kN MTS make servo-hydraulic uniaxial test system with PC based controller
Upgradation of INSTRON make servo-hydraulic uniaxial test system: 03 Nos
Hydraulic Power Pack 90LPM
Procurement of high temperature setup (which includes pull rods/grips, furnace and temperature controller) for ZwickRoell Vibrophore 100 material test system

Pneumatic forging hammer with 0.5-ton capacity
Conventional Lathe machine
CNC Lathe machine
Potentiostat/Galvanostat system for integration with EDM wirecut& Robotic MIG.
CNC Turn-mill machine(5-axis)

Furniture

Steel almirah – 3 Nos.
Office revolving chair – 2 Nos.
Office chair- 10 Nos.
Office executive wooden table – 4 Nos.
Sofa for Visitors
Chairs
Tables

Consumables

Metallography consumables (Emery Papers, Abrasive blades, Polishing cloths, Diamond blade, diamond suspension, Colloidal Silica, Ethanol, Methanol, Acetone and Etchants, Silver paste & Carbon tape etc.)
Coating and Corrosion study consumables (Na, K, Mg, Ca Chloride salts, Recrystallized alumina crucibles, Ceramic Paste & tubes, Purging gases, Graphite rods, Thermocouples & Platinum mesh Tungsten wire , Erodant and Ceramic Powders (SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , Cr ₃ C ₂ , SiC), Pure elements (Ni, Cr, Co, Si, Al & C powders)/ Test Material)
Sample Design, Fabrication & External Characterization
Stationary and Printing Consumables (A4 Xerox paper, Register, Notepads, Cartidges etc.)
Chemicals
Chemicals
Consumables
Consumable
super alloys-H-230 and H-188

Spares

Equipment for which spare is needed	Name of the spares
Bi-Potentiostat 3000A DX	high temp (~150 C) jacket, Gas purging utilities, Rotating Ring-Disk & Cylindrical Electrode, Connecting Cables
Potentiostat Interface 1000 (Gamry)	Connecting Cables
3D Optical Profilometer	Objective lenses and Upgradation of Analysis Software (Leica Map)
Close Loop Corrosion Evaluation System	SS SUBMERSIBLE PUMP, ELECTROCHEMICAL RIG & Other Accessories
Universal Tensile testing Machine	Software upgradation, extensometer, SCC set-up
High Temperature Furnace	Heating elements, Ceramic/Alumina Tube, Thermocouple and other accessories
Tube Furnace	Quartz/Mullite Tube
STA 449 F5 Jupiter (TGA+QMS)	TGA sample carrier system
Spares for Sulphur Analyzer, TGA, AFT	
Spares for XRF, AAS, ICP-OES	
Spares for Bomb Calorimeter	
Jet Mill	
TG-DTA	
TG-DTA	
Creep Crack Growth testing machine, Kappa 100ss, serial No.726363, part No. MP00427	
Servo- Hydraulic Test System Median-100, 100KN	
Very High Strain Rate Test System (VHS)	
INSTON make Multi- axial Test System	

Spares for Fronius TPS 500 robotic welding machine	
(a) Data logger for online monitoring of temperature	
(b) Welding current and voltage measurement sensor	
Spares and consumables for Sheet Metal Forming Machine (FLD)	
Spares parts for the Hot-Dip Process Simulator (HDPS)	
Upgradation of ZwickRoell Vibrophore 100 material test system for conducting HCF test in high temperature with the spare of one set of High temperature setup (which includes pull rods/grips, furnace and temperature controller)	
Spare parts for the Hot-Dip Process Simulator (HDPS)	
Spares and consumables for Gleeble Simulator	
Spares for Sulphur Analyzer, TGA, AFT	
Spares for XRF, AAS, ICP-OES	
Spares for Microwave Digester	
Batteries	
Induction furnace of different capacity (25, 50 and 75 kW)	
Induction furnace, (75 kW)	
Agilent ICP-OES Model No. 5110	
Repairing of control pannel of 2L autoclave	
Single stage oil sealed Rotary Piston Vacuum Pump with 5.5 KW three Phase Motor Model CO - 250 (HSN Code 8414) with Installation	
Jet Mill	
TG-DTA	
TG-DTA	

Closed loop corrosion rig	
Bi-Potentiostat 3000A DX	
Potentiostat Interface 1000 (Gamry)	
3D Optical Profilometer	
Tube Furnace	
STA 449 F5 Jupiter (TGA+QMS)	
UV Radiation Tester	
Spares for the HVOF system (*Details in Table 1)	
Spare for the Air Plasma Spray system (*Details in Table 2)	
Mass flow Controller (H2 and N2 gases) 02	
Magnetron sources (2 Nos.)	
Ball on disc tribometer Software update	
Heater control cable for Ball on disc tribometer (01No.)	
Sealing Plates of Gate Valve of Main Unit (Upper and Lower) 3 Upper Plates and 3 Lower Plates (6 Nos.)	
Complete Housing Sealing Flange of Gate Valve System (1 No.)	
O Rings for Sealing Plates of Gate Valve (6 Nos. (3 for Upper Plate and 3 For Lower Plate)	
O Rings for CV 21, 22, 23 (9 Nos.)	
Force Sensor Pneumatic Cylinder of Driving Rod (01 No.)	
Pilz Sensor Housing (01 No.)	
120-Y13 Valve (For High Dew Point) of Dew cal System (01 No.)	
Crucible for Molten Metal Bath (05 Nos.)	

Sample Holder (Spaced with 3 ceramic Plug) attached at Bottom of Driving Rod (3 Nos.)	
3 Ceramic Plugs Type K (Female Type) to be fixed into Sample Holder (3 sets (9 Nos.))	
Mini Comp. Ceramic Coupling, Type K (10 Nos.)	
Thermocouple Wire K type AlumelChromel, 26 SWG Make Kanthal (+ type and - type) 2 sets each (4 Nos.)	
Steel Specimen Holder of SS, U shape with Screw system (100 Nos.)	
Cooling Fan (Exhaust) for Gas Mix Station (1 No.)	
O Ring for Molten Metal Bath (2 Nos.)	
Metallic Cylindrical Central Pot of Molten Metal Bath (1 No.)	
Thermocouple for molten metal of Molten Metal Bath (1 No.)	
Electrical Connection Cable for Potentiostat (6 Nos.)	
Langmuir Probe (01No.)	
Acoustic Probe (02 Nos.)	
Berkovich Nanoindenter (02 Nos.)	
Spare for Fronius TPS500i robotic welding machine	
(a) Welding table with clamps	
Tools for dog-bone sample preparation for FLD	
Spares and consumables for Sheet Metal Forming Machine (FLD)	
Spare parts for the Hot-Dip Process Simulator (HDPS)	
Spares and consumables for Gleeble Simulator	
Spare for Microhardness machine	
Indentation Creep (IC) Test System Spares;	

a) LVDTs for strain measurement	
b) High temp pull rod and fixture	
c) Compact furnace	
d) Diffusion pump	
e) Rotary pump	
f) Vacuum gauges	
g) National Instrument data acquisition system	
h) WC flat end-cylindrical indenters	
i) Chiller unit and accessories	
High temperature Small punch Creep Test Fixture	
Ball indenters	
Creep Crack Growth testing machine, Kappa 100ss, serial No.726363, part No. MP00427	
Servo- Hydraulic Test System Median-100, 100KN	
Very High Strain Rate Test System (VHS)	
INSTON make Multi- axial Test System	
Liquid nitrogen plant	
EPMA	
FEG-SEM	
Vibratory Erosion Machine	
Hitachi SU7000 Field emission scanning electron microscope as below: 1. Ultra-High-Resolution Schottky Scanning Electron Microscope- Hitachi SU7000 and associated accessories 2. TEAM Pegasus Integrated EDS-EBSD.	

Portable Residual Stress Analyser Xstress3000	
Cu anode X-ray Tube for Bruker XRD	
Co anode X-ray Tube for Rigaku XRD	
Optical Microscope	
FEG-SEM	
Vibratory Erosion Machine	
Muffle Furnaces	
Polishing Machines	
Mounting Machin	
JEOL 2200FS TEM	
JEOL 2200FS TEM	
JEOL 2200FSTEM	

Annual Maintenance Cost

AMC for High performance computing cluster (HPC) for smooth function of simulation work
AMC for Gleeble simulator
Single lever type Creep Testing machines, Model No.2330-MM-230 & 2330-MS-230 ATS Sl.No.12-8283 (1 to 10) alongwith 42 items etc. Add : on 08.4.16 Repair charges Rs.17175
Instron made Material test systems
RKP450 Impact tester
BISS- Servo-hydraulic test systems
Fronius Power source TPS 500i CMT and Robot Kuka KR 8 R1610 arc HW
WIRE EDM (Make S&T)
CNC lathe Make : Batliboi
Wet Abbrasive Cutter
AMC for 3D-CMM
UV Radiattion Tester

STA 449 F5 Jupiter (TGA+QMS)
Cyclic corrosion test chamber
Muffle furnace with Inconel retort
Salt spray test chamber
3D Optical Profilometer
High-Temperature Nanoindenter
Ultrasonic 4-axis C-Scan system
Impedance Analyzer
Universal Testing Machine
Model – H25KS (Tinius Olsen Make)
Leica DM2500M Metallurgical Microscope
Vickers Hardness Tester , Model- VH50MDX
Vacuum furnace
Confocal Raman (*Required from Nov. 2023)