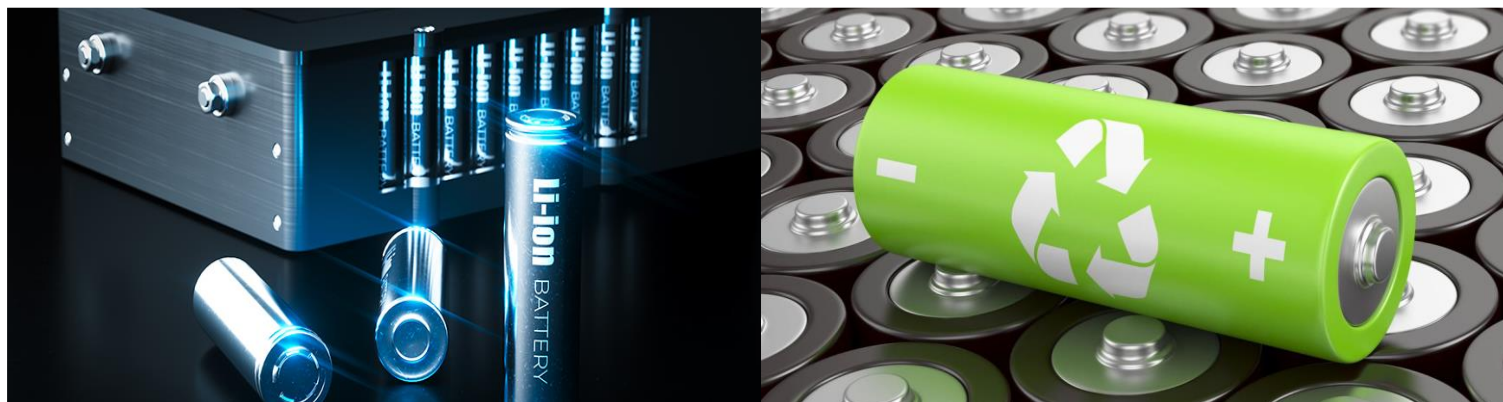


SENSITIZATION WORKSHOP ON E-WASTE MANAGEMENT RULE 2022

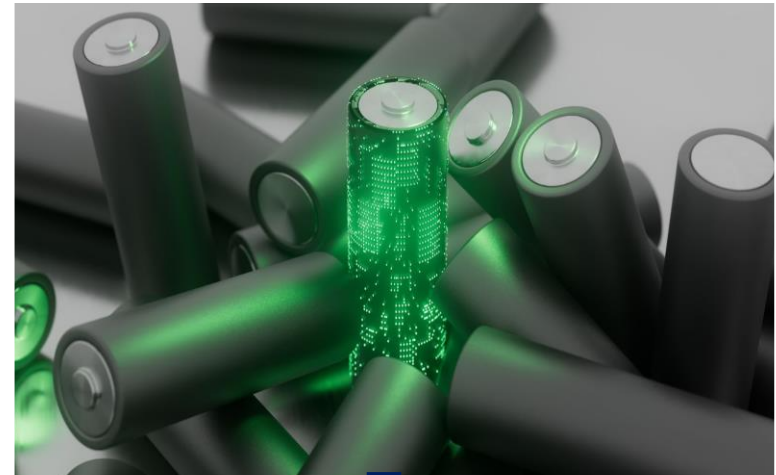


Cost Effective Li ion Battery Recycling Technology

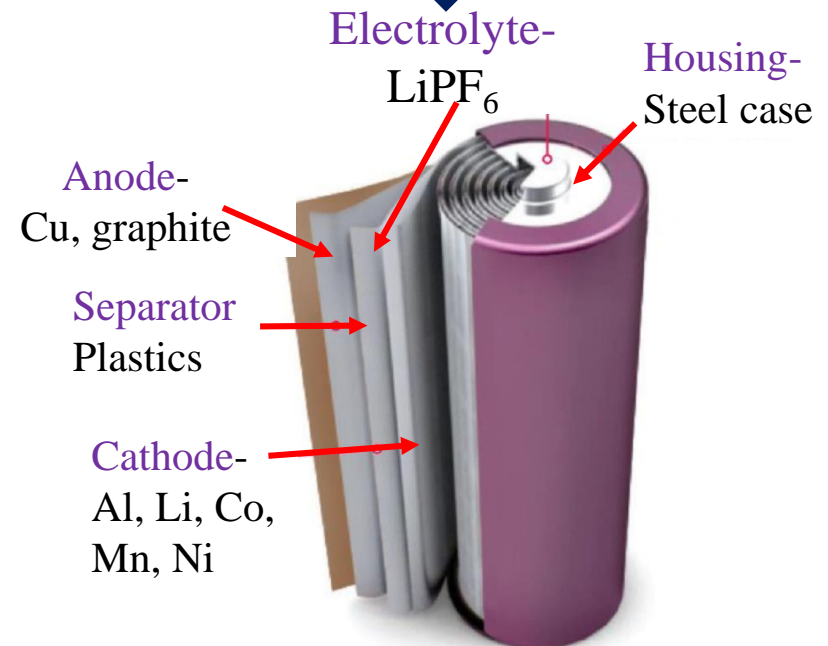
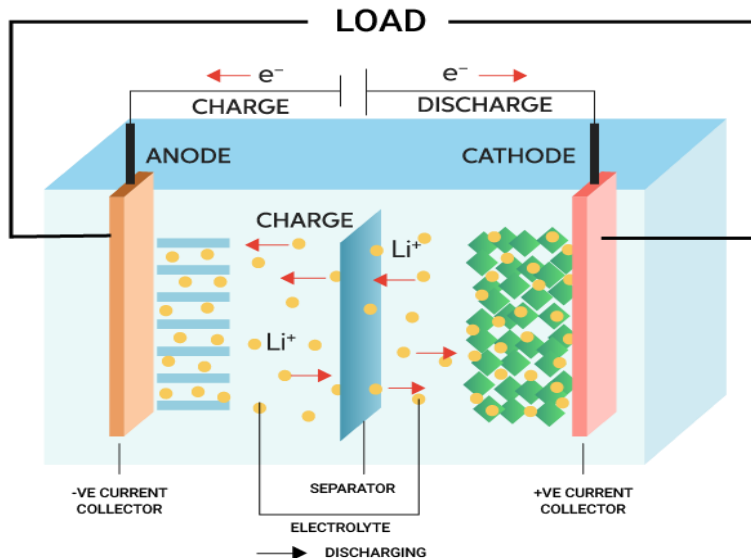
Presented by:
Dr Amit Barnwal
Research Scientist
amitmeh158@gmail.com
C-MET Hyderabad, India

Li-ion battery: Introduction

- A **lithium-ion battery** is a family of **rechargeable battery types** in which **lithium ions** move from the negative electrode to the positive electrode during discharge and back when charging.
- A battery is a transducer that **converts chemical energy to electrical energy** and vice versa
- **Contains-** Anode, Cathode, Separator, Casing



COMPONENTS OF LITHIUM-ION BATTERY

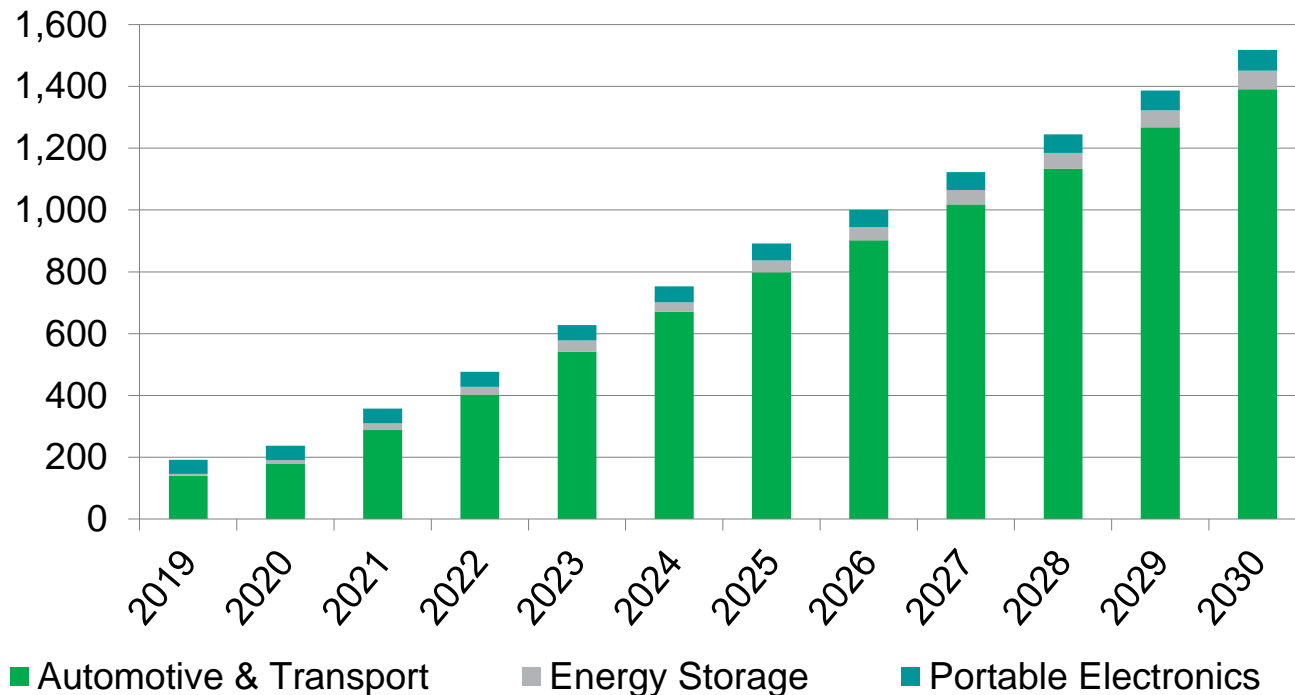


Application of Li-ion battery



Application of Li-ion battery

Global battery demand by major end market (GWh) - Li-ion only

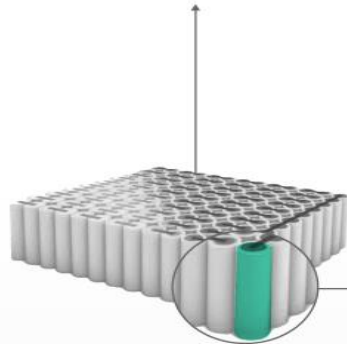


Notes: Demand is based on annual consumption of batteries by end market.
Source: IHS Markit; images left are from Getty Images and Shutterstock.

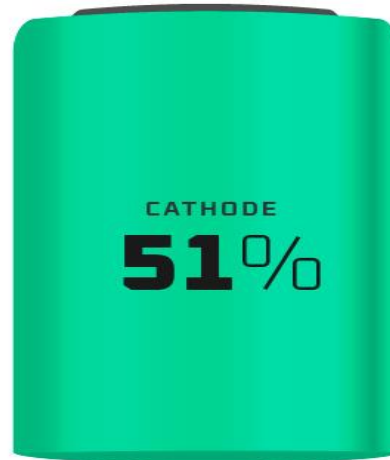
Electrical vehicle battery



EV CHASSIS



A **battery pack** consists of multiple interconnected modules, and each module is made up of hundreds of individual cells.



CATHODE
51%

The **cathode** material determines the capacity and power of a battery, typically composed of lithium and other battery metals.



Lithium



Nickel



Cobalt



Manganese

The largest EV battery **manufacturers** are all headquartered in Asia.

80% of all cell manufacturing occurs in China.



MANUFACTURING
& DEPRECIATION
24%



ANODE
12%

The **anode** is the negatively-charged electrode, typically made of graphite.



SEPARATOR
7%

Separators prevent electric contact between the cathode and the anode.



ELECTROLYTE
4%

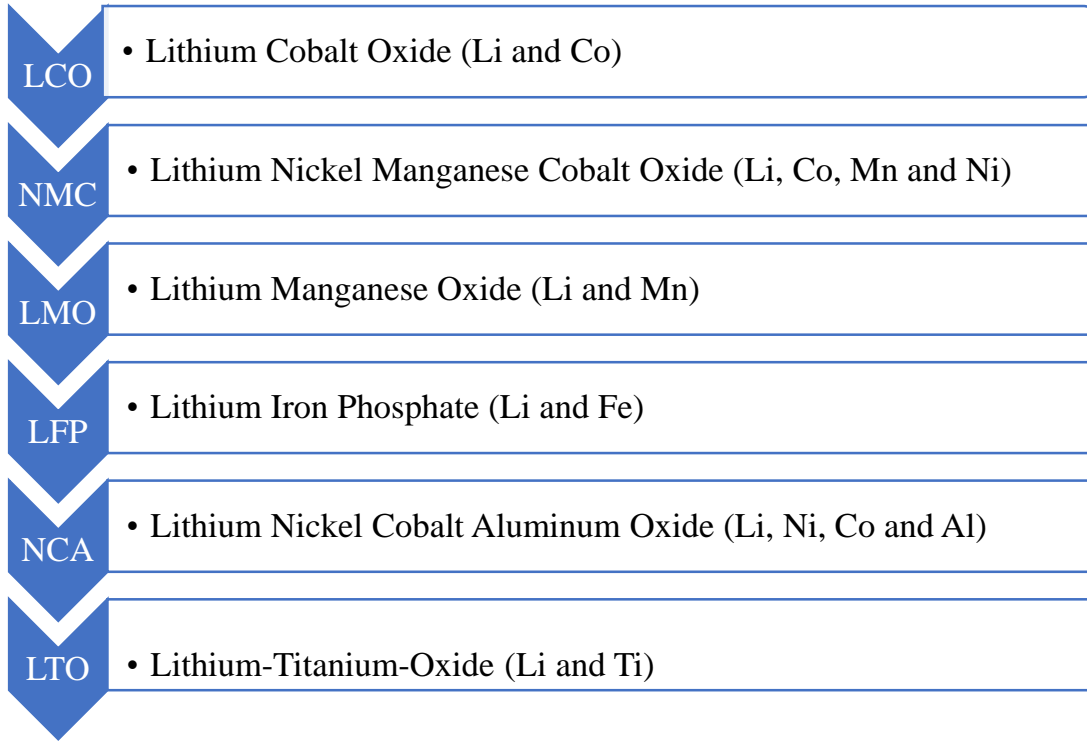
The **electrolyte** is the medium that transports lithium ions from the cathode to the anode.



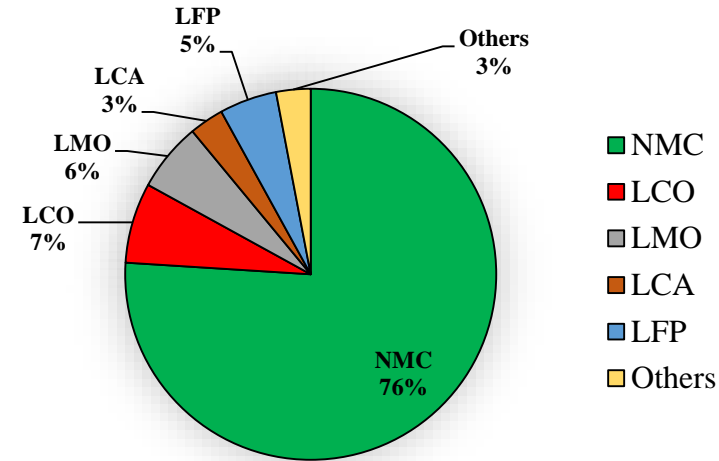
3%

Battery housings are cases that contain and protect battery packs, usually made of steel or aluminum.

Types of cathode materials in lithium ion batteries



Cathode Active Materials in 2030
(1670000 TONS)



Share of Cathode Active Materials

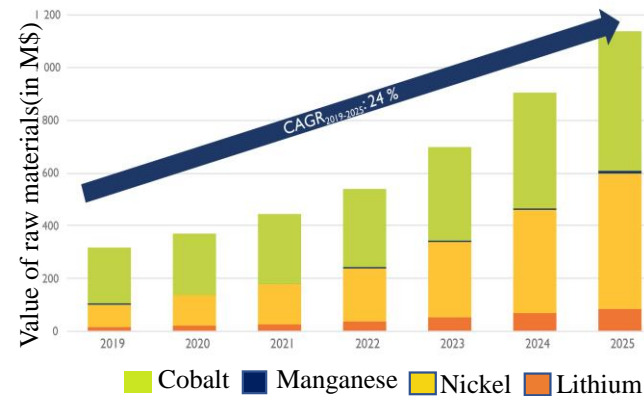
	Aluminum	Lithium	Cobalt	Nickel	Manganese	Copper	Graphite
USD/ton	1800	10000	35500	13200	2000	5800	800

Valuable metals present in Li-ion battery

Metal	Primary ores in the Earth Crust
Li	Spodumene, Petalite, Lepidolite and Amblygonite
Al	Bauxite
Mn	Pyrolusite, Romanechite, Manganite,
Ni	Laterites, Garnierite
Cu	Chalcopyrite, Chalcocite
Co	Cobaltite, Safflorite

2019-2025 value of raw materials present in Li-ion batteries going for recycling (in \$ million)

(Source: Lithium-ion Battery Recycling Market & Technology Trends 2020 report, Yole Développement, 2020)



List of critical RAW materials	RAW Materials	Critical Stage	Main Global producers	Main EU sourcing countries	Impact reliance	EoL (RIR*)	Selected Uses
	Cobalt	Extraction	Congo DR (59%) China (7%) Canada (5%)	Congo DR (68%) Finland (14%) French Guiana (5%)	86%	22%	Batteries Super Alloys Catalysts Magnets
	Lithium	Processing	Chile (44%) China (39%) Argentina (13%)	Chile (78%) United States (8%) Russia (4%)	100%	0%	Batteries Glass and ceramics Steel and aluminum metallurgy
	Natural Graphite	Extraction	China (69%) India (12%) Brazil (8%)	China (47%) Brazil (12%) Norway (8%) Romania (2%)	98%	3%	Batteries Refractories for steelmaking

*-The End-of-Life Recycling Input Rate (EoL-RIR) is the percentage of overall demand that can be satisfied through secondary raw materials

Refurbishment and Reusing of batteries



REPAIR SERVICE



Li-ion Battery Recycling

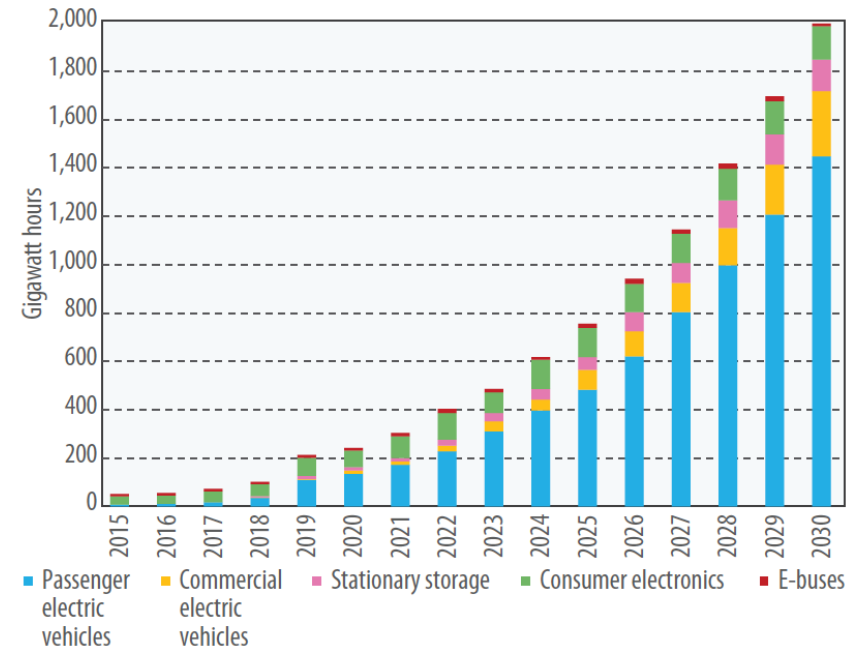
Driving force for recycling

- **Increasing consumption and demand**
- **Limited life span (2-6 years)**
- **Limited primary resources**
- **Risk of resource scarcity**
- **Environmental and human health concern**
- **Presence of critical / valuable metals**

Risk during recycling

- Explosion when the lithium comes contact with air and moisture
- Complicated steps of recycling
- Difficult to extract selectively
- Testing of batteries are difficult

Uses of lithium-ion batteries in the world, 2015–2030



Recycling of discarded LIBs

Discarded LIBs

Pyrometallurgical route

Hydrometallurgical route

Combined pyro – hydro metallurgical route

Li-ion Battery Recycling (Pyro)

Pyrometallurgical Process

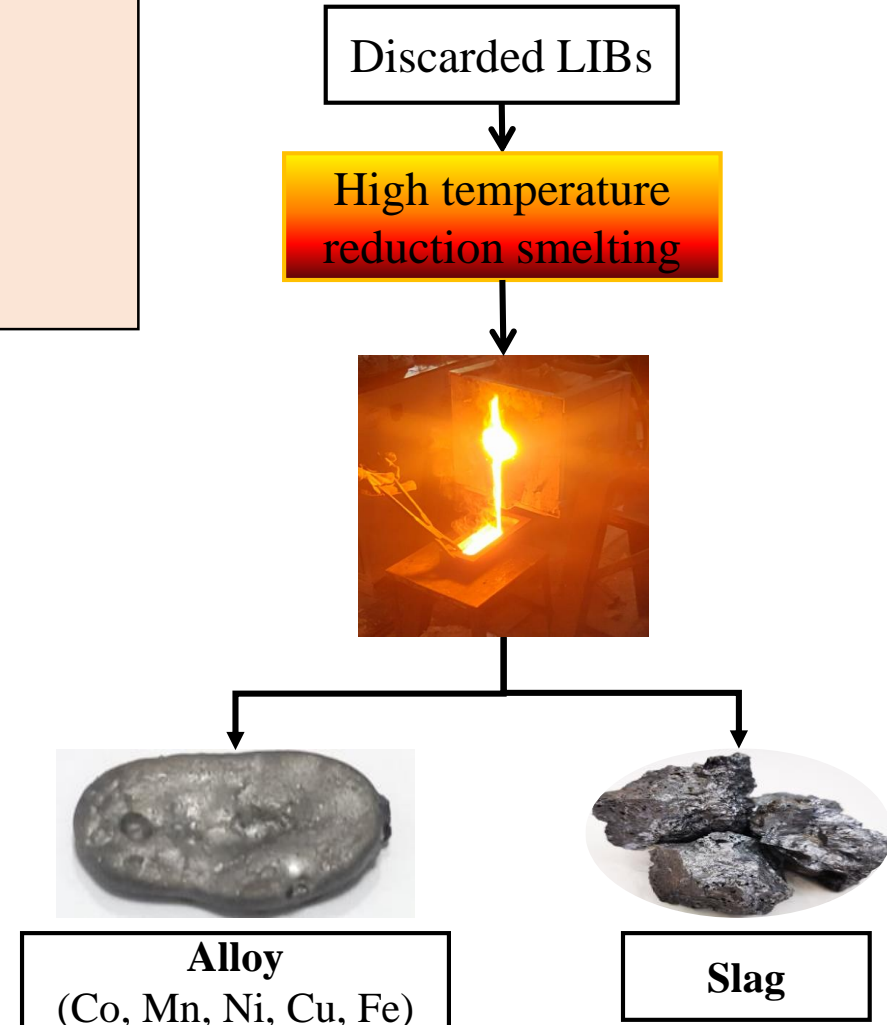
- ❖ Recovery of transition metals like Co, Ni etc.
- ❖ Huge investment for set up a plant
- ❖ Recovery rate is low
- ❖ Final residue is high
- ❖ High gas emission

Advantages:

- ✓ No pre-treatment
- ✓ Simple
- ✓ Large scale production

Disadvantages:

- ✓ High energy consumption
- ✓ hazardous gas emission
- ✓ Large scale production
- ✓ Al, Li values reports to slag



Li-ion Battery Recycling (Hydro)

Hydrometallurgical Process

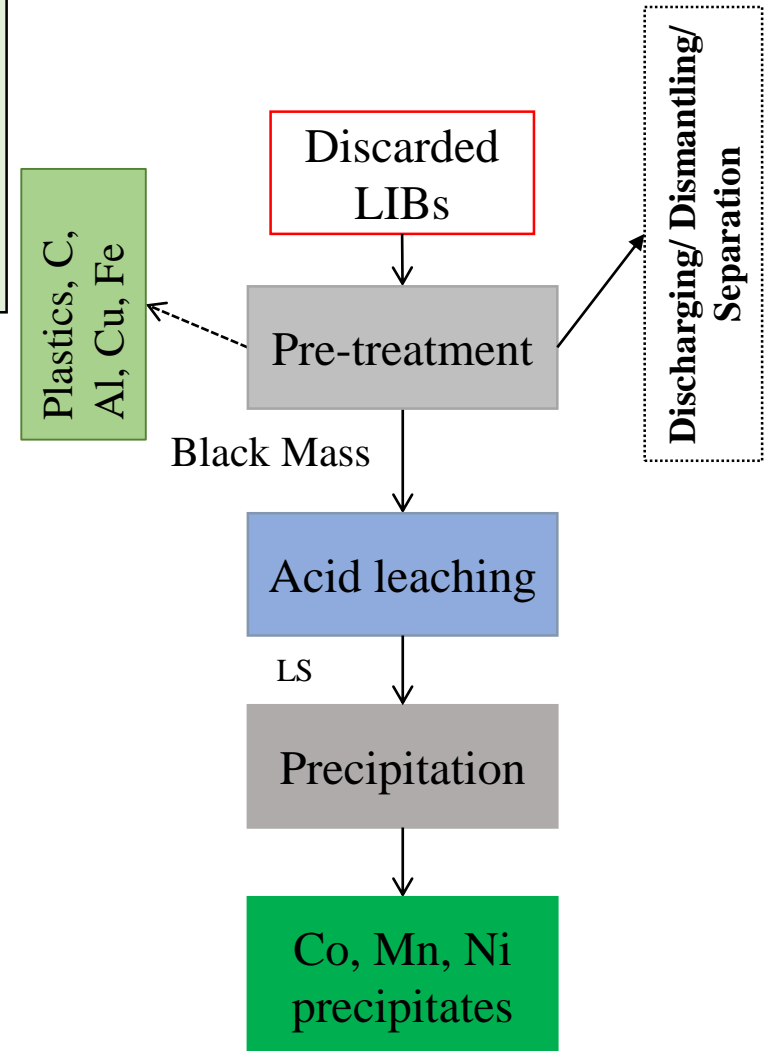
- ❖ Recovery of pure metals from active cathode material
- ❖ Recovery rate is high
- ❖ Final residue is low
- ❖ Low Gas Emission
- ❖ High Job creation as processes involved are labour intensive

Advantages:

- ✓ Low energy consumption
- ✓ High metal recoveries (> 95%)

Disadvantages:

- ✓ Multiple steps
- ✓ Large effluent generation requiring suitable treatment



LIB recycling: Scale up operation from lab scale to prototype plant scale

Scale-up

Leaching
Reactor



500 ml/batch



10 lit/batch



20 lit/batch



150 lit/batch

TRL-6

Solvent
Extraction

50 ml/batch



10 lit/batch



200 lit/batch



LIB recycling plant Inauguration



LIB Recycling Team



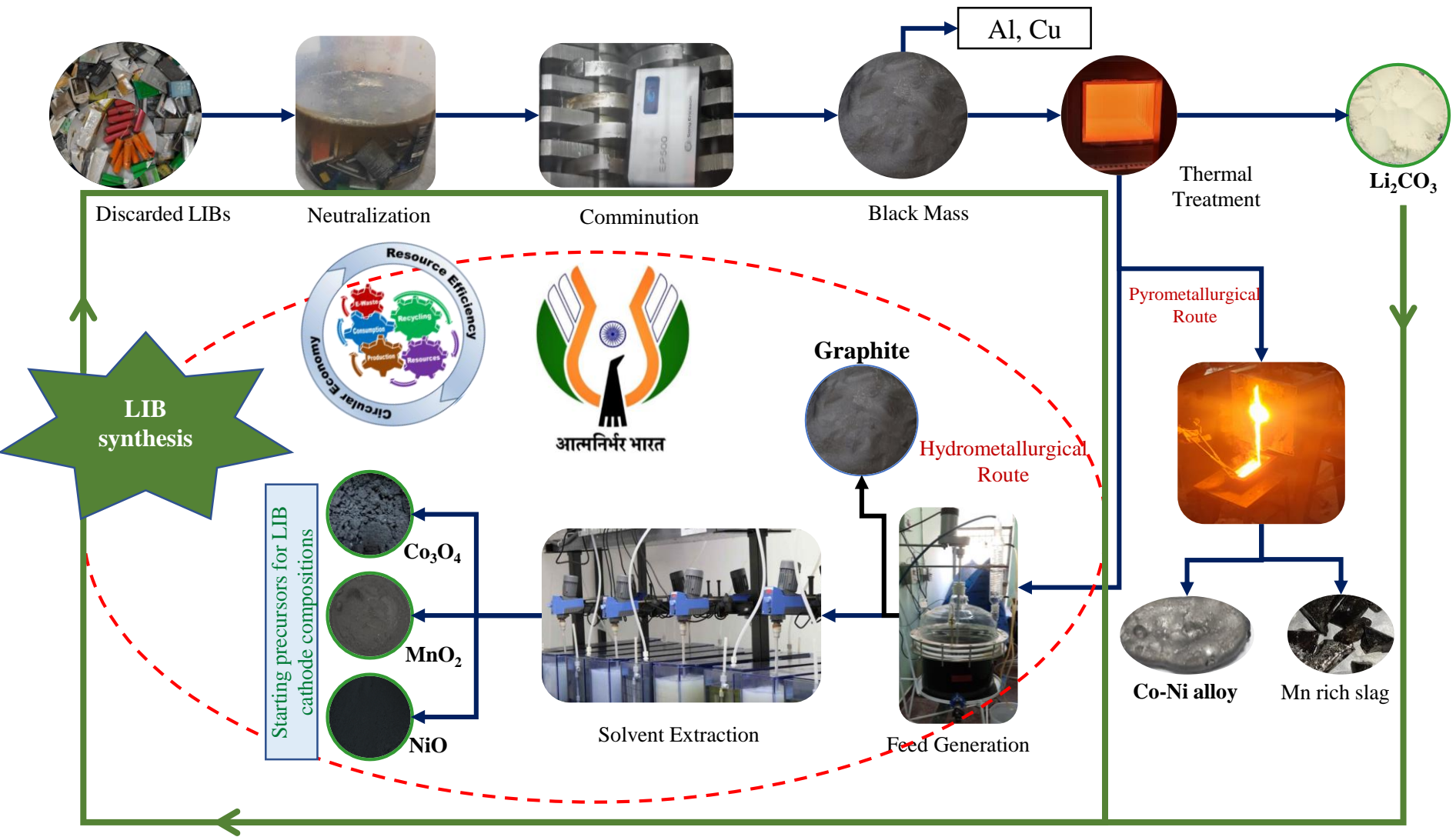
Technology Transfer



Achievement

- Developed **robust and sustainable LIB recycling technology** through hydrometallurgical route.
- Established of **LIB recycling prototype plant** for technology demonstration to industries for ToTs
- **Indigenous development** of all processing equipment
- **Up scaled LIB recycling technologies lab scale to proto-type plant scale (TRL-6)**
- Filed **2 Indian Patent and 1 US Patent** and published **2** Research articles in SCI journals based on LIB recycling
- More than **25 industries** have shown interest for absorbing the developed technology
- The developed technology has been **transferred to nine (9) recycling industries**

LIB recycling- Resource Efficiency & Circular Economy



Circular Economy and Greener Energy

**C-MET
Technology**

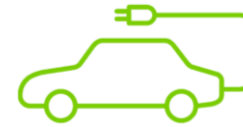
TRL-5



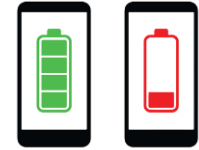
Recovered



Manufacturing



Application



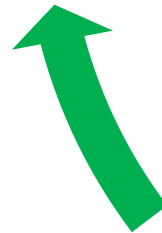
End-of-life



Refurbishment



Recycling



आत्मनिर्भर भारत



Circular Economy and Greener Energy

- **The reduction of battery scrap volume**
- **Proper recycling of li-ion batteries**
- **Recovery of metals content**
- **Saving of primary sources**
- **Cost effective rural solar lighting system**
- **Eliminate danger of waste of LIBs to environment**
- **Economic benefits**
- **Increased Job Opportunities**





**REDUCE
REUSE
RECYCLE**



Thank you

E-Waste (Management) Rules, 2022: Salient features

- ❖ **E-Waste (Management) Rules, 2022 is effective from April 01, 2023 and has superseded the E-Waste (M) Rules 2016**
- ❖ **The rules are applicable to every manufacturer, producer, recycler and refurbisher**
- ❖ **The Producers have been assigned annual e-waste recycling targets - Extended Producer Responsibility (EPR) Obligation based on either quantity of e -waste generated or quantity of EEE sold as the case may be.**

E-Waste (Management) Rules, 2022: Salient features

- **Ease of doing business, reducing compliance burden :**
 - Registration through online portal
 - Transparent, simplified and seamless online system for compliance
 - Recycling targets, instead of collection targets - stable for 2 years
- **Self-sustaining market mechanism**
 - **Market-based approach** - Generation and online trading of EPR certificate
- **Formalization of existing ecosystem**
 - Incentivizing informal sector for conversion to formal sector
- **Wider and more effective coverage :**
 - The number of EEEs covered increased to 106 (from 21)
 - Solar photo-voltaic modules or panel or cells and have also been included-no recycling target, only storage till 2034-35.

E-Waste (Management) Rules, 2022: Salient features

• Ensuring Integrity :

- Provisions for Audit
- Ultimate responsibility fixed on producer - Imposition and collection of environmental compensation in case of violation.
- Reverse calculation based on end product

• Circular Economy in the sector:

- Focus on recovery of material – EPR Certificate based on End Products
- Opportunity for urban mining
- Incentivising refurbishing (purchase of refurbishing certificates extended producer responsibility of the producers by the duration for the corresponding quantity of e-waste and shall be added to the extended producer responsibility of the producer upon expiry of the extended life of the refurbished product)

Definitions

PRODUCER

- (i) Manufactures and offers to sell EEE and their components or consumables or parts or spares under its own brand; or
- (ii) offers to sell under its own brand, assembled EEE and their components or consumables or parts or spares produced by other manufacturers or suppliers; or
- (iii) offers to sell imported EEE and their components or consumables or parts or spares; or
- (iv) who imports used electrical and electronic equipment;

E-WASTE RECYCLERS

'Recycler' means any person or entity who is engaged in recycling and reprocessing of waste EEE or assemblies or their components or their parts for recovery of precious, semi-precious metals including rare earth elements and other useful recoverable materials to strengthened the secondary sourced materials and having facilities as elaborated in the guidelines of the CPCB;

REFURBISHERS

'Refurbisher' means any person or entity repairing or assembling used electrical and electronic equipment as listed in Schedule-I for extending its working life over its originally intended life and for same use as originally intended, and selling the same in the market;

EPR – Recycling Targets

Stakeholder	Modalities	
Producers	- To fulfil EPR Obligations as per Schedule - III	
	A. New EEE - Placed in the market	
	Year	E-Waste Recycling Target (by weight)
	2023-24	60% of the quantity of an EEE placed in the market in year Y-X, where 'X' is the average life of that product.
	2024-25	60% of the quantity of an EEE placed in the market in year Y-X, where 'X' is the average life of that product.
	2025-26	70% of the quantity of an EEE placed in the market in year Y-X, where 'X' is the average life of that product.
	2026-27	70% of the quantity of an EEE placed in the market in year Y-X, where 'X' is the average life of that product.
	2027-28	80% of the quantity of an EEE placed in the market in year Y-X, where 'X' is the average life of that product.
2028-29 onwards	80% of the quantity of an EEE placed in the market in year Y-X, where 'X' is the average life of that product.	
	B. Imported EEE	
	The importers of used EEE shall have 100% extended producer responsibility obligation for the imported material after end of life, if not re-exported	

E-Waste Management Status

Terminology	Description
Rules	<ul style="list-style-type: none"> • E-Waste (Management) Rules, 2016 • E-Waste (Management) Amendment Rules, 2018 • E-Waste (Management) Rules, 2022-effective from 01-04-2023
E-Waste Generation (2021-22)	1601155.36 tonne (2021-22)
Number EPR Registration granted	1805 (As on date) On-line application received on the portal - 2615
Recyclers Registration	48 (as on date) On-line application received - 94 Login credential generated - 440 569 under rules 2016 capacity - 1790348.27 tonne
E-Waste processed by Dismantlers / Recyclers (FY 2021-22)	5,27,131.57 MT

- ❖ EPR Portal for Producer and Recyclers Registration is operational
- ❖ Interim arrangement provided for recyclers and producers



TerraNova

Eco Management Pvt Ltd

‘E-Waste Collection Strategies & Extraction of Metals and Precious metals

12th September 2023

CPCB

Presented by : Guha Jayaram

Collection Strategies

Sector	Overview
Bulk Consumers	Collection directly from Corporates, warehouses. High Volumes Good Quality of materials – Not Scavenged
Dealers, Repair Shops	Spread Across the country. Network needs to be built. Medium Volumes Collections must be weekly. They cant hold volume due to space constraint. Material quality is good. Cost of procurement is high as they expect resale prices on spares
Consumers	Low Volumes – Very High Price of Collection. Done as a part of Buyback, Exchange programs Significant for awareness
Informal Sector	High Volumes available for collection Low quality of materials. High Price of Procurement. Price demand based.

Strategy – Collect from All Sectors depending upon the economic feasibility

Recycling Facility – What is needed

The following are the List of Machineries in the Recycling Unit.

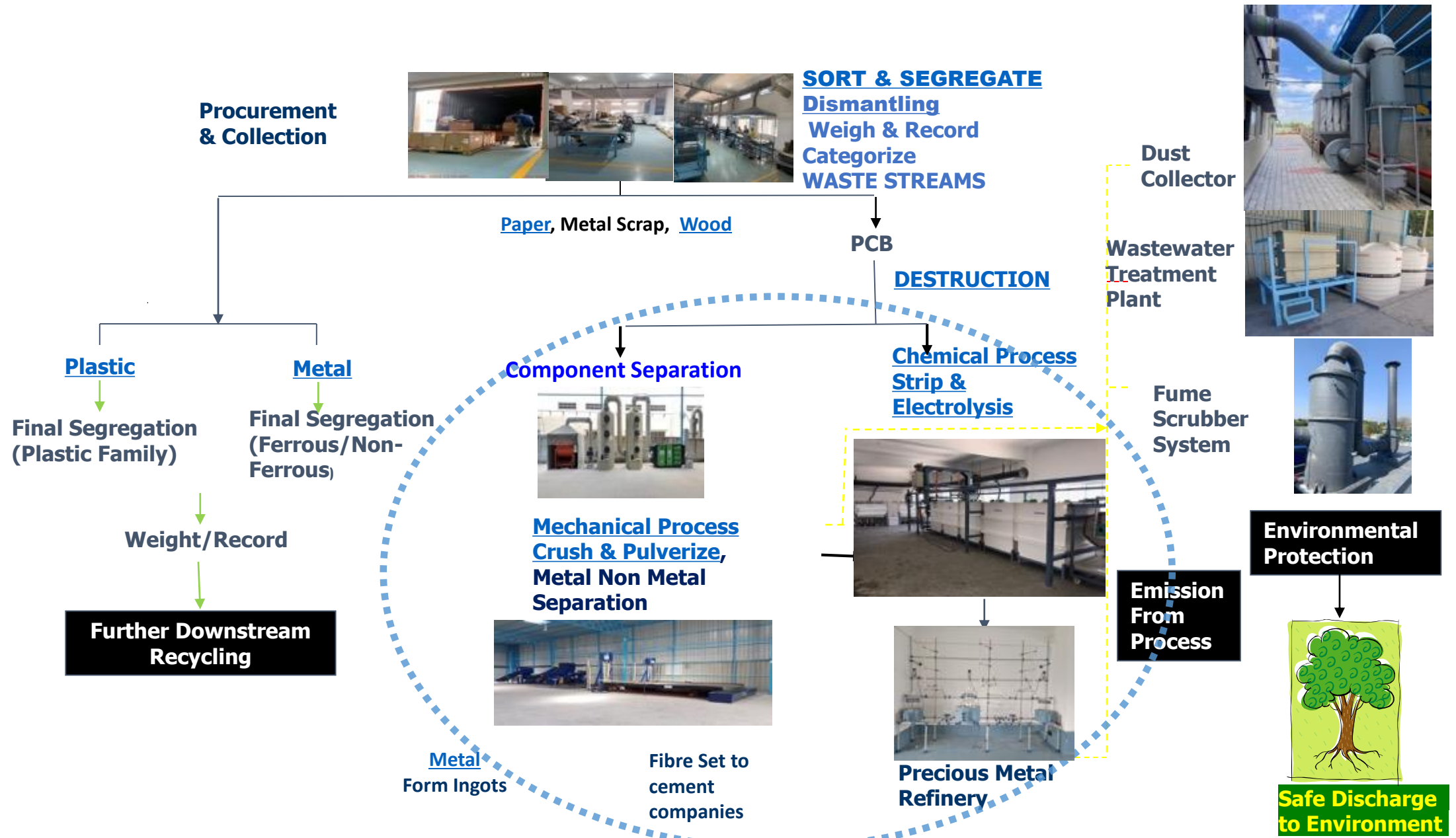
- Segregation & Dismantling
- Cable Recycling
- PCB Recycling
- Compressor Cutting, Radiator Cutting (For Ref & ACs)
- Aluminum Smelting –
- Copper Smelting –Precious Metal Recovery which Includes Alkaline Stripping, Electrolysis, Acid Recovery process, Precious metal refining.
- CFL Recycling
- CRT Recycling
- Cartridge Recycling

Pollution Control system Includes

- Dust Collector system with Cyclone and Bag House for Mechanical Process.
- Scrubber for Smelting
- Fume Scrubber for Chemical Process
- Sewage Treatment Plant for domestic Wastewater
- Wastewater Treatment plant for chemical process

Even for a moderate facility All of these are needed

Overall Process Flow

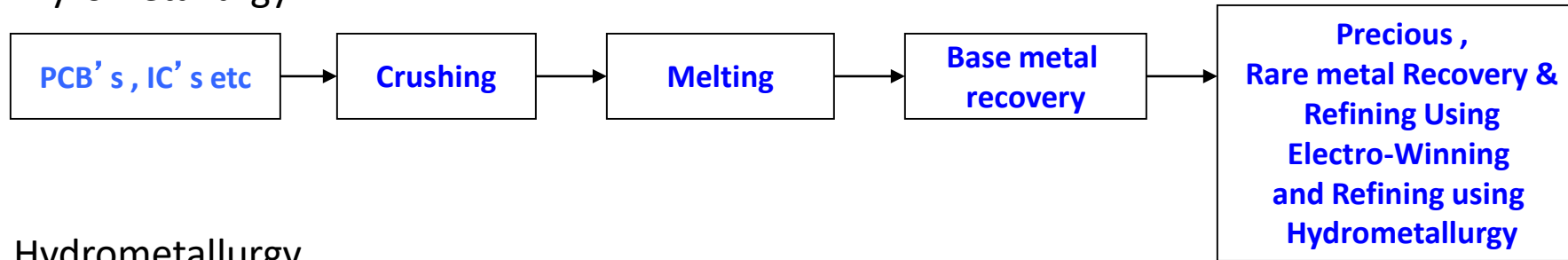


Various Techniques used for Precious Metal Recovery

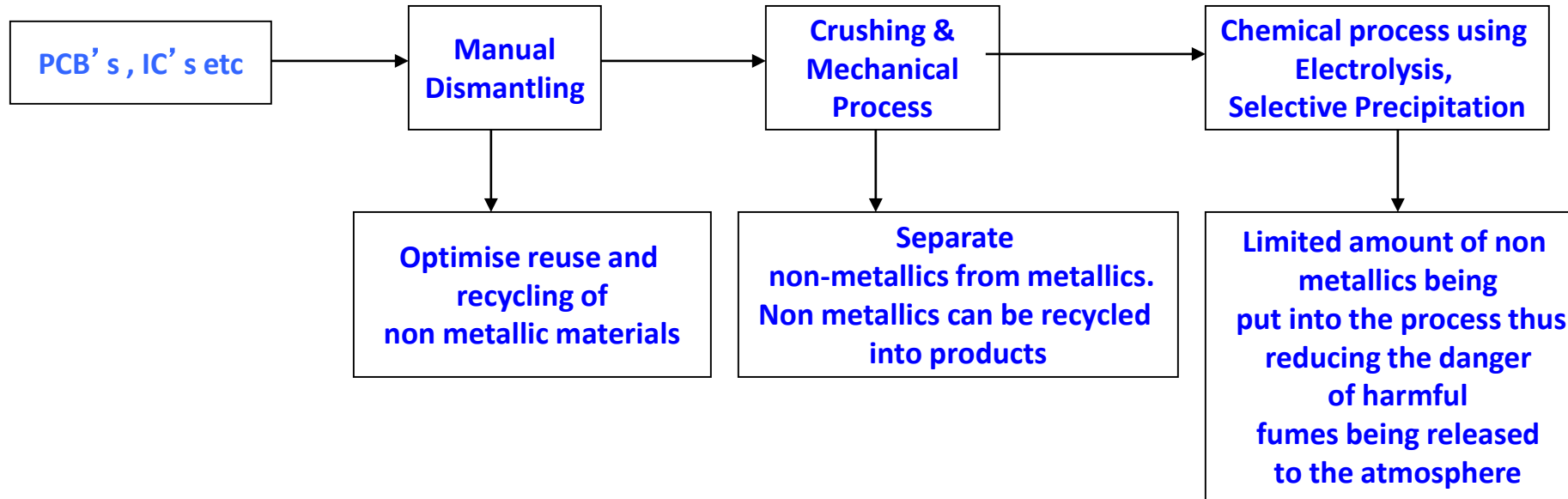
Current Technique	Novel Technique	Remarks
Resource Recovery – Use of Parts, Enhance Life of Equipment		Indirect way of Preserving the Depleting Resources.
Pre Processing – Segregation, Dismantling Mechanical Process		Best Process to Achieve Recycling Efficiency and Recovery of All Materials
<p>Gold Stripping – Cyanide Based.</p> <p>Pros:</p> <ul style="list-style-type: none"> • Cost Effective • Easy Handling <p>Cons:</p> <p>Usage and Disposal of Cyanide.</p>	<p>Non Cyanide Based Strippers</p> <p>Pros:</p> <p>Not Using Cyanide.</p> <p>Cons:</p> <ul style="list-style-type: none"> • More Reaction Time • More Expensive 	In-spite of the Risks associated with Cyanide even now it is the most commonly used Technique. It is still the Best Technique provided the disposal is taken care of Properly
<p>Precious Metal Recovery using Hydro-metallurgy</p> <p>Dissolution and Selective Precipitation. Very Effective.</p> <p>Can Recover Au, Ag, Pt, Pd</p> <p>Recovery efficiency is not as high as pyrometallurgy.</p>	<p>Precious Metal Recovery using Bio Leaching of Precious Metals</p> <p>* Not Commercially Tried</p>	

Pyro metallurgy and Hydrometallurgy

Pyrometallurgy



Hydrometallurgy



* In the current scenario Pyrometallurgy though very efficient is not feasible due to various factors like pollution due high temperature handling, economic feasibility, very high investment etc.

Precious Metal Recovery



Selective Dissolution and recovery using Electrowinning.

After Recovery Refining is done to purify the metals.

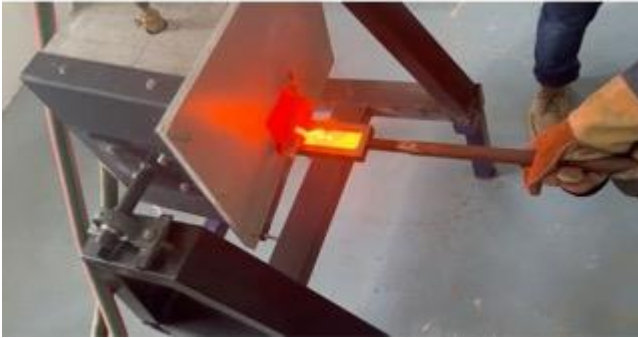
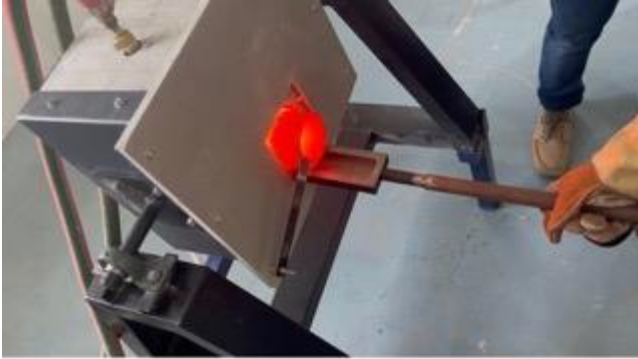
Copper and Aluminum Melting Plant



- There are smelters available but having an inhouse facility will help in capacity building
- 300-500 Kgs capacity plant will suffice



Precious Metal Melting



After Refining Precious metals Ingots are formed by melting.

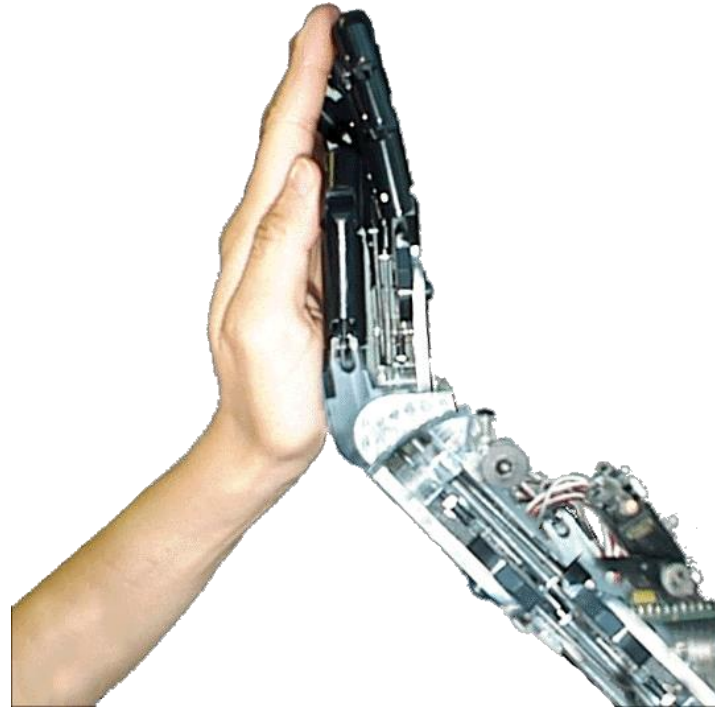
For Gold and Silver Ingots are preferable.

Pt and Pd salts are formed as products

Humble Recommendations

- Bulk Consumer Integration methods needed – Biggest source of leakage of material from the formal sector.
- Bulk Consumers to STOP Auctions without Audit of Recycling Facility. – CPCB guideline needed.
- “Regular & In-depth” Audit of Recycling process - Key to success of the New Rules.
- Depth of audit BEFORE generating Certificates – Very Important.
- Over and above metals and precious metals we need to look into plastics disposal, Non recyclables disposals to TSDF, Co-Processing while generating certificates.
- Mechanism of Recycling to be prioritized/ looked into/ closely monitored over mere GST invoices.
- Operational Furnace of Cu/Al – Mandatory for L-2, L-3 Recycler.
- Conversion Factor incentives for L-3 facilities – Very Important.
- Provide optimum Technical support & Financial Assistance to Company’s wishing to setup L-3 facility.

We truly deserve a World Class E-waste Recycling facility in BHARAT.



Thank you for your Kind Attention



Sensitization Workshop On E-Waste

By
Virender Kaul
Head Operation

CPCB Regional Directorate
Bangalore

E-PARISARAA PVT. LTD.,
Plot No. 30 – P3, KIADB, Dobaspet Indl. Area,
Bangalore Rural Dist. – 562 111

website: www.ewasteindia.com

email: recycle@ewasteindia.com

During the Mann ki Baat Programme 29th January 2023, by our Hon'ble Prime Minister Shree Narendra Modi ji did mention about E-Parisaraa work on E-waste Management and Circular Economy.



E-waste is a valuable resource

Recycling meets the requirements of “Swachh Bharat Mission”.

Recycling drastically reduces energy consumption and Carbon foot print

Reduced water consumption

Reduced pollution of Air, water and Soil.

Generate employments in both rural and urban sector

Effects resource conservation by preventing dumping into landfills

Recycling also directly helps in “**Make in India & Made in India**” to achieve **Zero defect and Zero effect**.

Future economic, environmental, social sustainability depends on recycling of so-called waste materials



Environmental Benefits of Recycling

Every ton of Steel recycled makes the following savings:

- **75% of the energy needed to make steel from virgin material**
- **40% of the water required in production**
- **1.28 tons of solid waste**
- **Reduction of air emissions by 86%**
- **Reduction of water pollution by 76%**

Every ton of Aluminum recycled makes the following savings:

- **6 tons of bauxite**
- **4 tons of chemical products**
- **14MWh of electricity**

It takes 70% less energy to recycle Plastics

It takes 40% less energy to recycle Glass

Every ton of Paper recycled saves 17 fully grown trees.

Problem: Informal Sector Recycling Contd..



Bareilly

The Times of India

Advanced Search

Sports Cricket Entertainment TV Life & Style Travel Women Spirituality Blogs NRI Real Estate Photos

RELATED KEYWORDS: Moradabad | kids-die | Gold | E-Waste | Disposal

Brass city emerges as illegal e-waste disposal hub

TSN | Oct 20, 2014, 09:30PM IST

Like Share 3 Tweet 4 +1 0 Share

MORADABAD: The city is fast emerging as the new hub of unauthorized disposal of e-waste, exposing labourers as well as residents to killer toxic fumes. Hundreds of workers, including women and children, in several localities here burn motherboards and other discarded gadgets to extract small quantities of gold and silver therein. The hazardous activity fills up the area with choking fumes, causing serious health complications to not only the offenders but also residents in nearby areas.

On Sunday, residents in Mughalpura locality had to rush out of their houses, coughing and choking due to billowing smoke engulfing the area. "There was panic in the area. People were coughing. Their eyes were reddened. Patients and pregnant women had to be rescued from their houses while a few had to be admitted to hospitals nearby," said Noman Mansoori, president of handicraft welfare society who lives in the area.

Senior superintendent of police Love Kumar ordered a door-to-door search operation and arrested many persons involved into the illegal trade red-handed.

Ads by Google



E-PARISARAA - INFRASTRUCTURE

India's First Recycling operations since Sep. 2005



Dobaspet, Bangalore Rural, Karnataka



Hindupur, Andhara Pradesh

Dismantling and Segregation



Dobaspet, Bangalore Rural, Karnataka



Segregation after Dismantling



Hindupur, Andhara Pradesh

Our New Recycling facility near Hindupur, AP



E-waste Authorization received during December 2020



Dismantling line



Spent Lithium Ion Battery processing area

Innovation Smelter Designed & Fabricated by EPPL – C-MET

1 Ton Capacity PCB's Smelter with Common Gas Cleaning System and Oxygen Enriched Air blown into Combustion Chamber.



Gas Cleaning : Cyclone Separator, Adiabatic quench column, packed bed column, Bag filters.
Capacity : 1 Ton PCBs /day
Fuel : Coke, Oxygen enriched Air
Max Temp : 1350° C

Molten Material Collection & Clear Black Copper Separation



EPPL specially designed Molten Metal Collection MS Ladle



Metal & slag collection
in MS Ladle



Black copper Ingot

Slag



Black copper Ingots

Re-melting – Refining – Anode Bar Casting: Fuel- Diesel, Air



Diesel Fired Tilting Furnace designed by EPPL



EPPL designed Graphite Stirrer Arrangement



EPPL designed Stacker with weighing M/C for Holding Mould



Previous Anode Bar : 370 mm x 80 mm x 10 mm

Wt.of each anode bar: about 3 kg

Present Anode Bar : 600 mm x 100 mm x 30 mm

Wt.of each anode bar about 12 kg

Electro Refining



Resource recovery from E-Waste



Sources of Gold Plated E-Waste (Network boards, Processors, Components, Connector pins etc)



Glass Plant For Metal Extraction By Leaching attached to air Pollution control unit at the exhaust



Selective Recovery of Gold from Segregated Gold Plated E-Waste using Selective Aqueous Strippers for Apparent gold plated areas only.



Collected Gold Foils



Recovery of Gold sponge from E-Waste



Anode Slime recovery by electrolysis for precious metal by Smelting of PCBs using C-Met Technology

Analytical Laboratory Facilities





SWATCH BHARATH ABHIYAN



Reuse of EoL Solar PV Panels for Construction of Toilet Pods



**Collaboration beyond Territory continued for the last three years
With Ehime University Japan
Discussing the progress of research related to environmental issues**



**Dr. Sinshuke Tanabe and his team of Ehime University Japan
at E-Parisaraa, Bangalore, 19-9-2014**

CORPORATE SOCIAL RESPONSIBILITIES

- Participated in various exhibitions
 - World Environmental Day 2004 to 2014
 - World Earth Day 2006 to 2014, Bangalore
 - GO GREEN Fest.
 - The European Union-India Workshop on Management of Electronic Waste
 - National Environment Awareness Campaign
 - Workshop on E-waste Awareness and disseminate information among industries
 - Programs organized by TERI, TOXIC LINK, CMCA, Saahas etc
 - Presented more than 200 presentation across the country.



Recent Publications in print media

V18/22, 11:03 AM

Industry Services Special - August - 2022 - Industry Outlook Magazine



IS PROUD TO PRESENT

E-PARISARAA

AS ONE OF THE

TOP 10
EWASTE RECYCLING
COMPANIES
2022

in acknowledgement of its unwavering focus and dedication to achieve excellence in quality and delivery in this field.

Sudhakar Singh

Sudhakar Singh
Managing Editor
Industry Outlook

E-PARISARAA A GO-TO NAME FOR E- WASTE RECYCLING



E-Parisaraa (EPPL), India's first Government authorized electronic waste recycler started operations from September 2005, is engaged in Recycling of Waste Electrical and Electronic Equipment (WEEE) in Environmentally Sound Manner meeting Swachhita Bharath. The objective of EPPL is to create a Circular Economy to transfer e-Waste into industrially beneficial raw materials such as Metals, Plastics and Glass using simple, Cost Effective methods. Various metals such as Mild Steel, Stainless Steel, Aluminium, Copper, Brass and even Precious Metals, Rare Earth Metals, Various Engineering Plastics such as ABS, HIPS, PC, PP, PVC and others, Glass from CRTs, Tube lights, CFL, and so on, are recovered and converted to raw materials for remanufacture of another product. For Example the mild steel from Cabinets, Chassis are Hydraulically compacted and sent for melting in to ToR steel used in Civil construction in Industry, recycled engineering plastics are pelletized and molded into another product, and there by meeting Circular Economy.

EPPL Procures e-Waste from MNCs, Producers and Bulk Consumers, Producer Responsible Originations and arrange the Logistics. Data Destruction from storage devices are carried out as per the customer requirement. EPPL, Hindupur, Andhra Pradesh Unit in addition to the above services our Hindupur unit also recycles, Spent Lithium Ion Batteries from Mobile Phones, Laptops, Mobile Towers, Electric Two Wheelers and Electric Four wheelers. This ensures Resource Recovery of Energy Metals such as Cobalt, Nickel, Lithium, and many more, and conforms to Global Circular Economy.

Our recycling process consists of manual dismantling, segregation, shredding, crushing, pulverizing and density separation. We have strong backing of well-equipped Laboratory with Sample Preparation, Testing & Analysis, using Conventional Volumetric & Gravimetric analysis, Atomic Absorption Spectrophotometer, EDXRF techniques.

Industry Services TOP 10
E-WASTE RECYCLING
COMPANIES - 2022

Our Technical Team consists of three company directors, one General Manager, six managers, fifteen engineers, one environmental executive, and about one hundred and eighty member work force out of them 70 percent being women.



EPPL is providing all the necessary Personnel Protective Equipments (PPEs) to the employees, with adequate training, Periodic health monitoring of Employees is done. Monitoring of air, water & noise is being done by third party audits.

EPPL has developed several indigenous process, Designed and Fabricated Machineries for e-Waste recycling and thus meeting 'Make-in-India' and 'Made-in-India'.

EPPL has developed several indigenous process, Designed and Fabricated Machineries for E-waste recycling PROCESSES, Make in India and Made in India

EPPL has conducted several awareness Programmes, Presentations, National and International conferences, Workshops, Exhibitions, Involved in Several Research Projects of Engineering of India, Publication of Technical Papers, Involved in training of informal sector, and downstream vendors. EPPL has bagged Three National awards including an award from President of owned reputed laboratories, and several awards from Prestigious Institutions. ||



CIRCULAR ECONOMY

E-WASTE MANAGEMENT

Leveraging TRUE POTENTIAL



Last three years can be termed as - years of environment reforms' as Govt introduced many laws on one common premise: Circular Economy. Dr Parthasarathy looks at the way forward

“World is witnessing depletion of all types of natural resources. In such a scenario Circular Economy (CE) is the demand of the hour and we have to make it a mandatory part of our lives". This was stated by the Prime Minister Modi at the recently concluded plenary session titled "Energy for Sustainable Growth" in March this year at Glasgow.

Finance Minister Nirmala Sitharaman, in her 2022 Budget address, under article 94, stated before the Parliament, "The circular economy transition is expected to help in productivity enhancement as well as creating large opportunities for new businesses and jobs.

The action plan for ten sectors such as electronic waste, end of life vehicles, used oil waste and toxic and hazardous industrial waste are ready. The focus now will be on addressing important cross cutting issues of infrastructure, reverse logistics, technology upgradation and integration with informal sector.

Recycling is a necessary component of circular economy after considering the possibility of reuse, remanufacturing and repair.

CE is based on 3 principles - eliminate waste and pollution, circulate product and materials, and regenerate nature.

Looking at the pressing issue of e-waste, CE for managing e-waste will result in resource efficiency, reduction in pollution and waste generation, extend product life, recovery of valuable base metals, precious metals and rare earth materials, recovery of various types of engineering plastics and as well as various types of glasses.

MeitY has brought out a whitepaper on CE with an

aim to achieve Atmanirbhar Bharat vision. (see QR code given below)

India is already blessed with huge labour force that can be employed for collection, transportation, dis-assembly in the e-waste industry. By recycling the e-waste, the valuable resource of metals, plastics, glass etc will be simultaneously built. This will take India one step closer to zero land fill, zero discharge and zero defect & zero error. Whereas repair and refurbishing are already being undertaken for life cycle extension of products.

NITI Aayog and MeitY also released a paper, 'Strategy on Resource Efficiency in Electrical and Electronic Equipment Sector' which noted that Information and Communication Technology (ICT) sector possess great opportunities which will go well with the development of the secondary material generation by recycling.

Meanwhile, it will have the environmental benefits such as reduced waste generation and pollution, reduced water consumption, reduced electric power consumption and therefore contributes towards reduction of GHG emission and help meet Climate Change Commitments.

There is an acute need to establish a policy framework encapsulating clear CE objectives:

- Need to expand the scope of items in Schedule I of E-Waste (Management) Amendment Rules and include recycling of lithium ion batteries.
- Conduct regular awareness programmes on CE involving all stakeholders.
- A digital platform for e-waste management to ensure accountability of all stakeholders.



10 MATERIAL RECYCLING 03 MAY 2022

THANKS FOR YOUR ATTENTION.

Questions ?

Please contact

recycle@ewasteindia.com



Restriction of Hazardous Substances (RoHS) Test Procedures and Compliance

Dr. U. Rambabu *M.Phil., Ph.D*

Principal Scientist & Quality Manager
RoHS Testing Division

Centre for Materials for Electronics Technology (C-MET)

Min. of Electronics & IT (MeitY), Govt. of India

IDA Phase - III, Cherlapally,

Hyderabad - 500051,

Telangana

Rationale for RoHS Directive

Land filling or illegal dumping of WEEE



Destruction of Ecosystem



Ecological Destruction

- ☐ Air
- ☐ Water Quality
- ☐ Soil Pollution

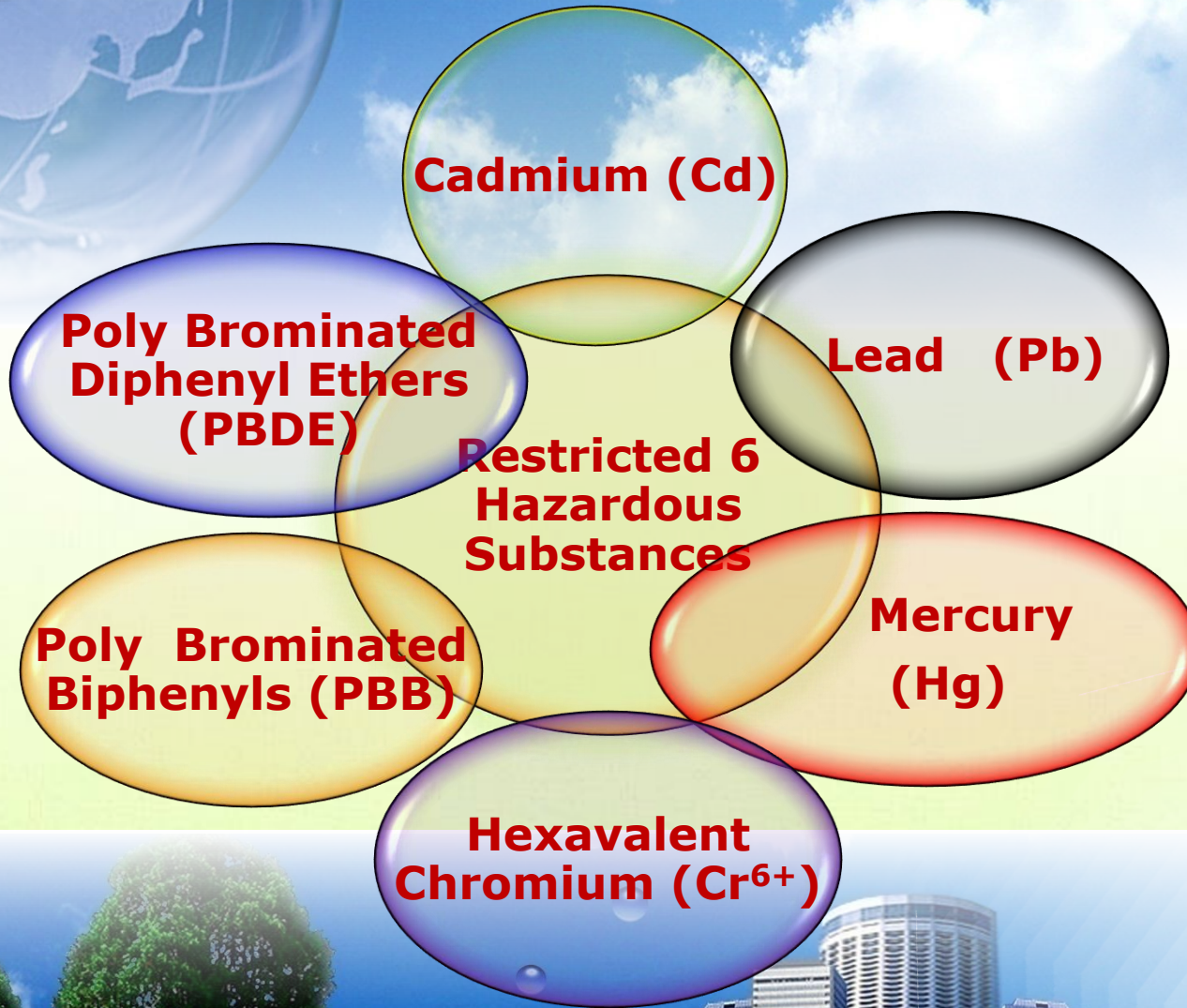
RoHS/WEEE: Keeps to a Minimum of Environmental Destruction and Adverse Health Effect on Eco System

Effect on Food



Adverse Health Effects

Restricted Hazardous Substances



Substances to be added to RoHS3



- Bis (2-ethylhexyl) phthalate (DEHP)
- Butyl benzyl phthalate (BBP)
- Dibutyl phthalate (DBP)
- Diisobutyl phthalate (DIBP)

Phthalates or **phthalate esters**, are esters of phthalic acid. They are mainly used as plasticizers, i.e., substances added to plastics to increase their flexibility, transparency, durability, and longevity. They are used primarily to soften polyvinyl chloride (PVC).

Lower-molecular-weight phthalates, those derived from C3-C6 alcohols, are being gradually replaced in many products in the United States, Canada, and European Union over health concerns.

They are replaced by high-molecular-weight phthalates (those with more than 6 carbons in their backbone, which gives them increased permanency and durability). In 2010, the market was still dominated by high-phthalate plasticizers; however, due to legal provisions and growing environmental awareness and perceptions, producers are increasingly forced to use non-phthalate plasticizers.

Substances restricted by RoHS (...EU) directives

Directive 2002/95/EC Of The European Parliament and the Council on the Restriction of the Use of Certain Hazardous Substances in electrical and electronic equipment (RoHS)

Restricted Substance	Where used now	Max.Conc Value(% by Wt. Of Homogeneous material)
Lead	Solders, termination coatings, paints, pigment, PVC stabiliser, batteries	0.10%
Cadmium	Coatings, solders, semiconductors, contacts, PVC stabiliser, pigments	0.01%
Mercury	Fluorescent lamps, batteries, sensors, relays	0.10%
Hexavalent chromium	Coatings to prevent corrosion (on zinc or aluminium or in paints)	0.10%
PBB	Flame retardant in certain plastics (no longer produced)	0.10%
PBDE	Flame retardant in certain plastics (actually several different products)	0.10%



Restriction on use of hazardous substance leading to reduced need for special handling of e-waste

Categories of Electrical and Electronic Equipment (EEE) Covered by EU WEEE & RoHS

Large Household Appliances

Small Household Appliances

IT and Telecommunications Equipment

Lighting Equipment

Electrical and Electronic Tools (with the exception of large-scale stationary industrial tools)

Toys, Leisure and Sports Equipment

Medical Devices (with the exception of all implanted and infected products not covered by RoHS)

Monitoring & Control Instruments (Not covered by RoHS)

Automatic Dispensers



Whom does RoHS affect

RoHS affects all the players in the electrical and electronic goods supply chain, including:

1. Original Equipment Manufacturers (OEMs)
2. Component makers
3. Sub-contractors
4. Assemblers
5. Distributors
6. Exporters
7. Traders



If you deal in any of these goods, your business is likely to be affected by RoHS:

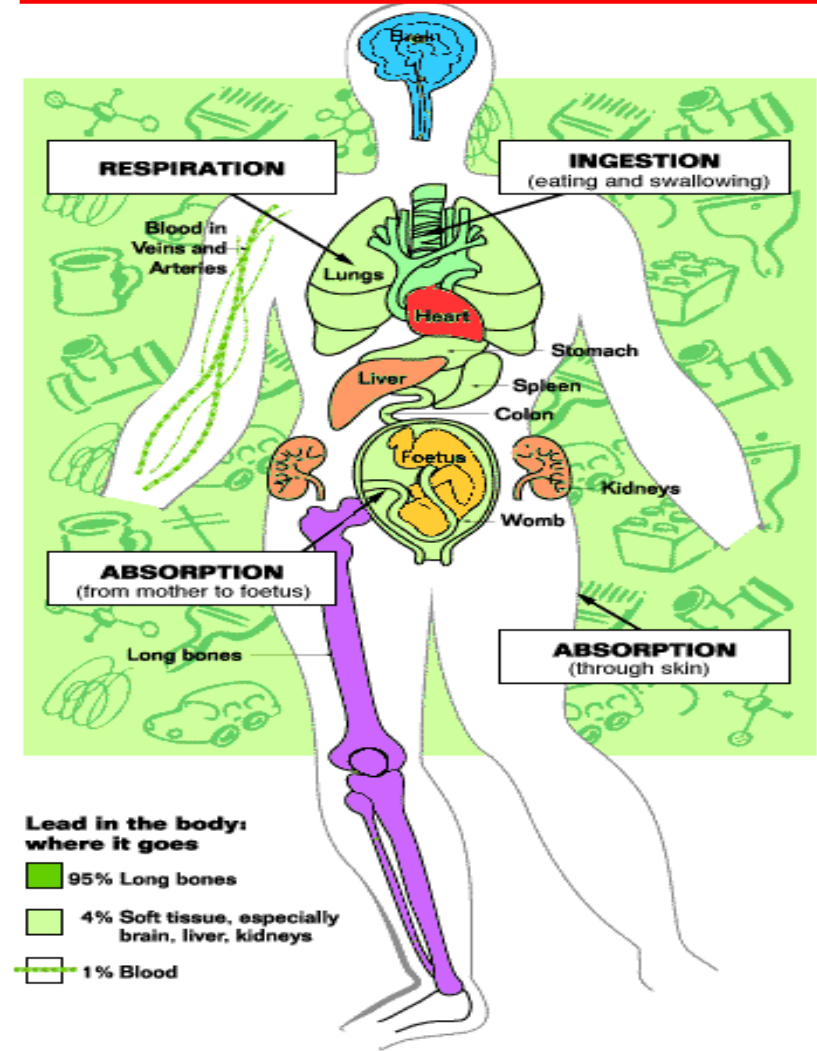
1. Electrical equipment
2. Electronic products
3. Machinery and equipment except for large stationary tools
4. Electronic components
5. Metal fabrication
6. Rubber and **plastics**
7. Cables and wires

.....Supply chain management is crucial

Absorption of Lead



Distribution of Lead



Neurologic Effects of Lead

- ❖ Neurologic effects on children documented at levels below 10 mcg/dL
- ❖ Low exposure effects: lowered IQ, attention deficits, and impaired hearing
- ❖ High exposure effects: irritability, convulsions, coma, or death
- ❖ Similar effects in adults at higher exposure levels



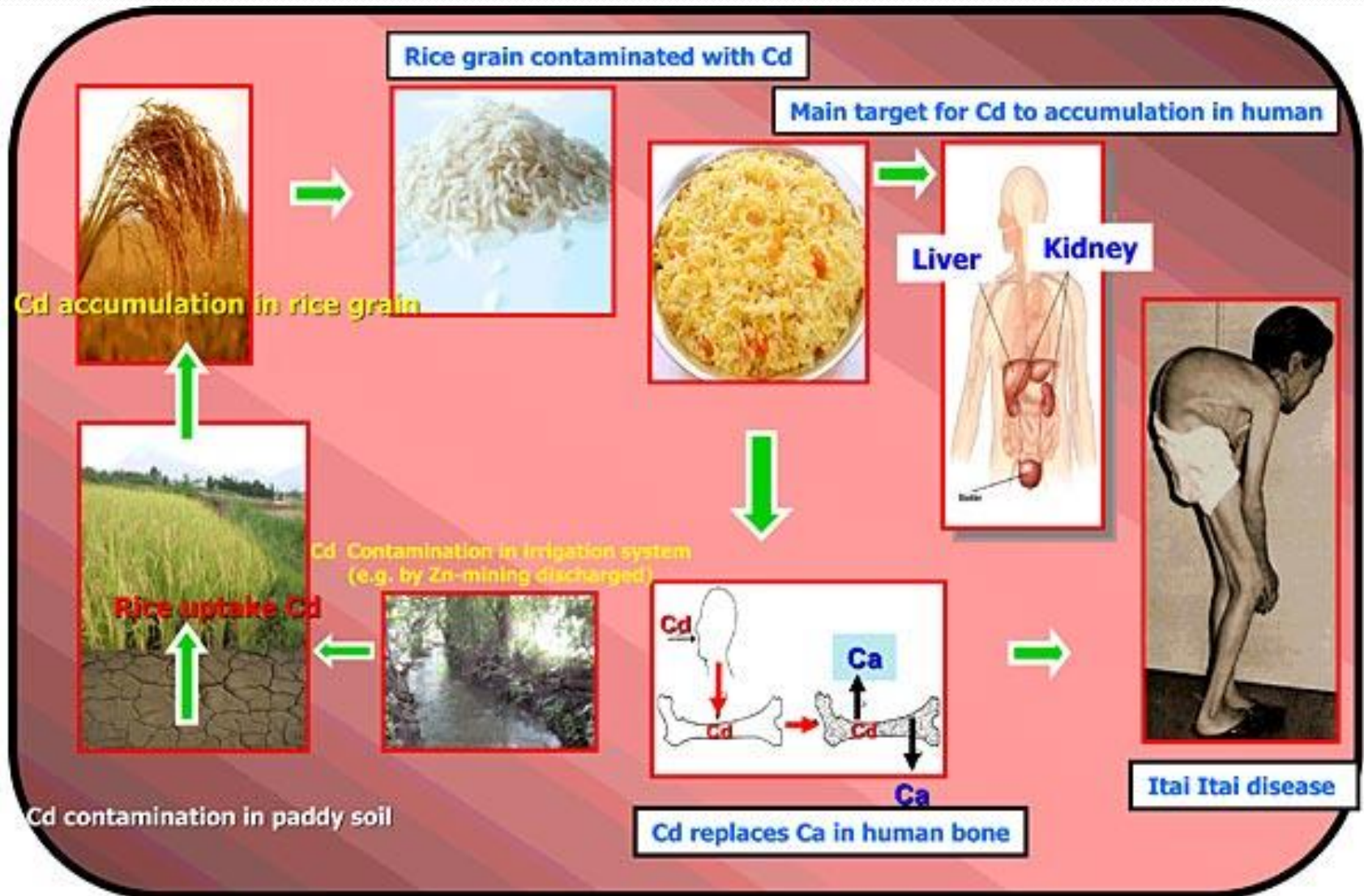
Cadmium-Cd

- ❖ Human uptake of cadmium takes place mainly through food
- ❖ Foodstuffs that are rich in cadmium can greatly increase the cadmium concentration in human bodies (liver, mushrooms, shellfish, mussels, cocoa powder and dried seaweed)

Health Effects

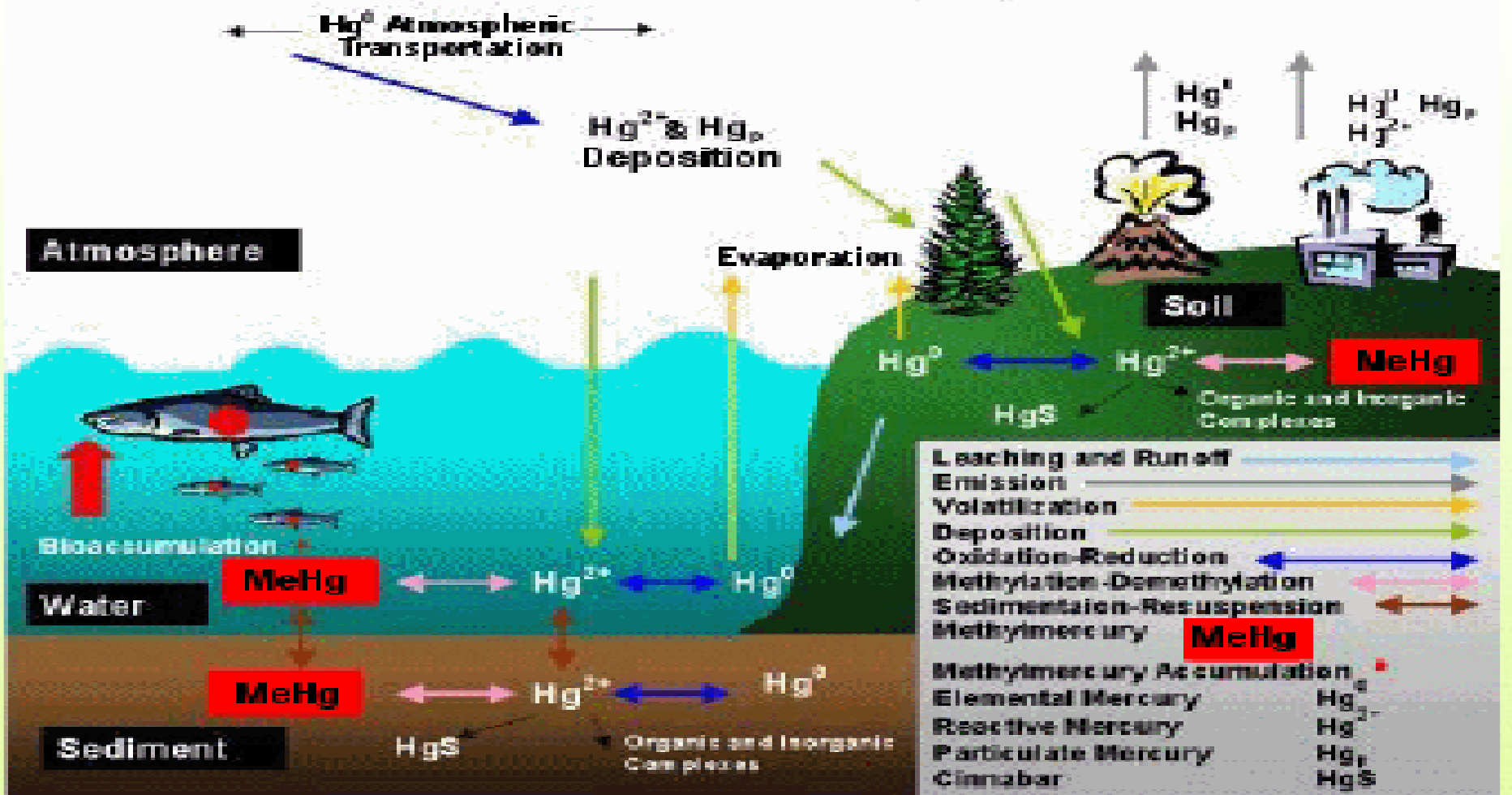
- ❖ Diarrhoea, stomach pains and severe vomiting
- ❖ Bone fracture
- ❖ Reproductive failure and possibly even infertility
- ❖ Damage to the central nervous system
- ❖ Damage to the immune system
- ❖ Psychological disorders
- ❖ Possibly DNA damage or cancer development

Health Effects





Conceptual Biogeochemical Mercury Cycle

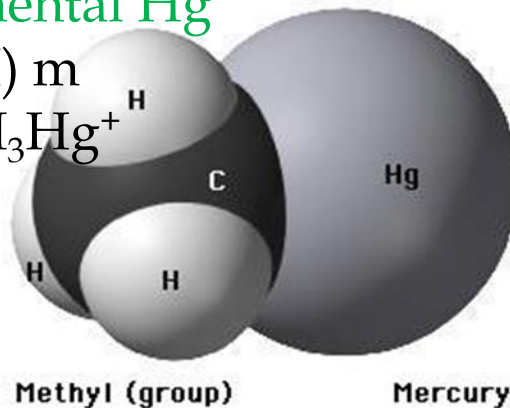


Methyl Mercury

❖ Most readily bioaccumulated- accumulates within organism faster than it is eliminated.

❖ 2-step process from elemental Hg

- Oxidation into Hg(II) m
- Methylation into CH_3Hg^+



❖ Plants do store some Hg, but most of that nasty CH_3Hg is found lurking in bodies of water.

❖ Predatory fish and the animals that directly consume them tend to store the highest concentrations.



Pregnant Woman should avoid consuming any animal with any significant amount of Hg.



Public Notice



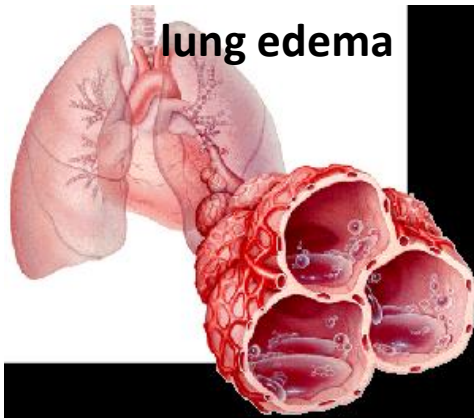
Why these are banned?



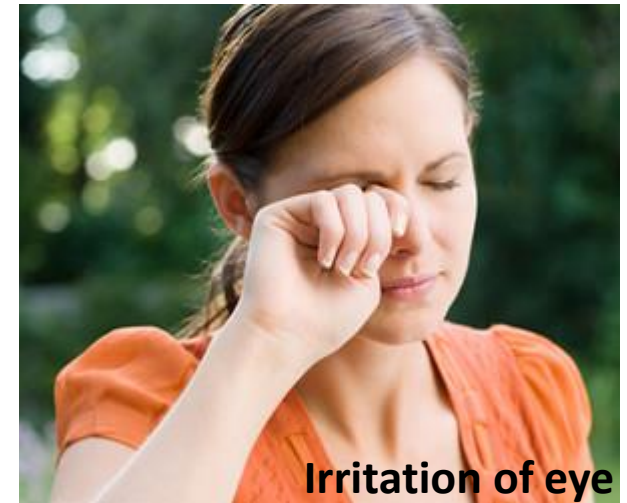
Pb



Why these are banned?



Hg



Why these are banned?



anaemia

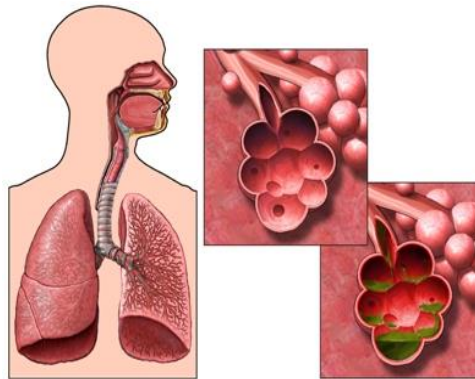
weakness



Cd



kidney disorder

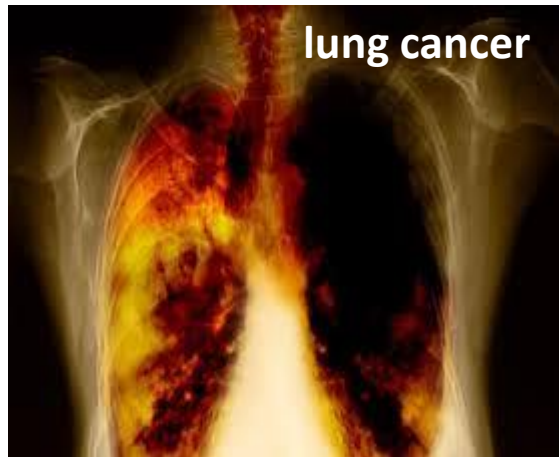


Lungs infection



itai-itai deceases

Why these are banned?



Cr^{6+}





Hexavalent Chromium (Chromium 6) Primary Route of Entry

		
Inhalation	Skin Absorption	Ingestion



Why these are banned?



PBB & PBDE





PHTHALATES

FOUND IN

Color cosmetics, fragranced lotions, body washes and hair care products, nail polish and treatment

HEALTH CONCERNS

Endocrine disruption, developmental and reproductive toxicity, organ system toxicity, bioaccumulation

WHAT TO LOOK FOR ON THE LABEL

phthalate, DEP, DBP, fragrance

REGULATIONS

Banned in cosmetics sold in the EU

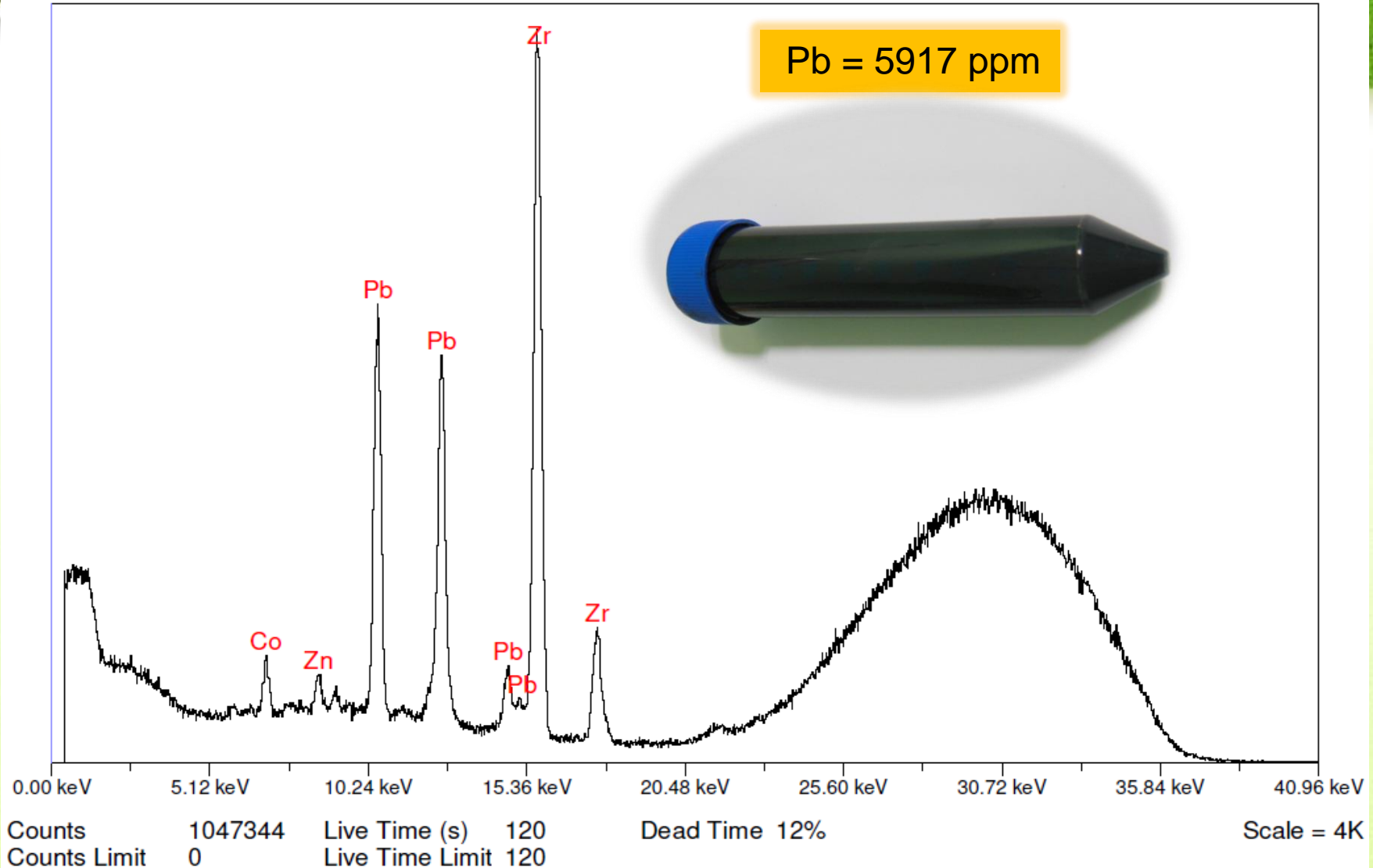
The Campaign for Safe Cosmetics



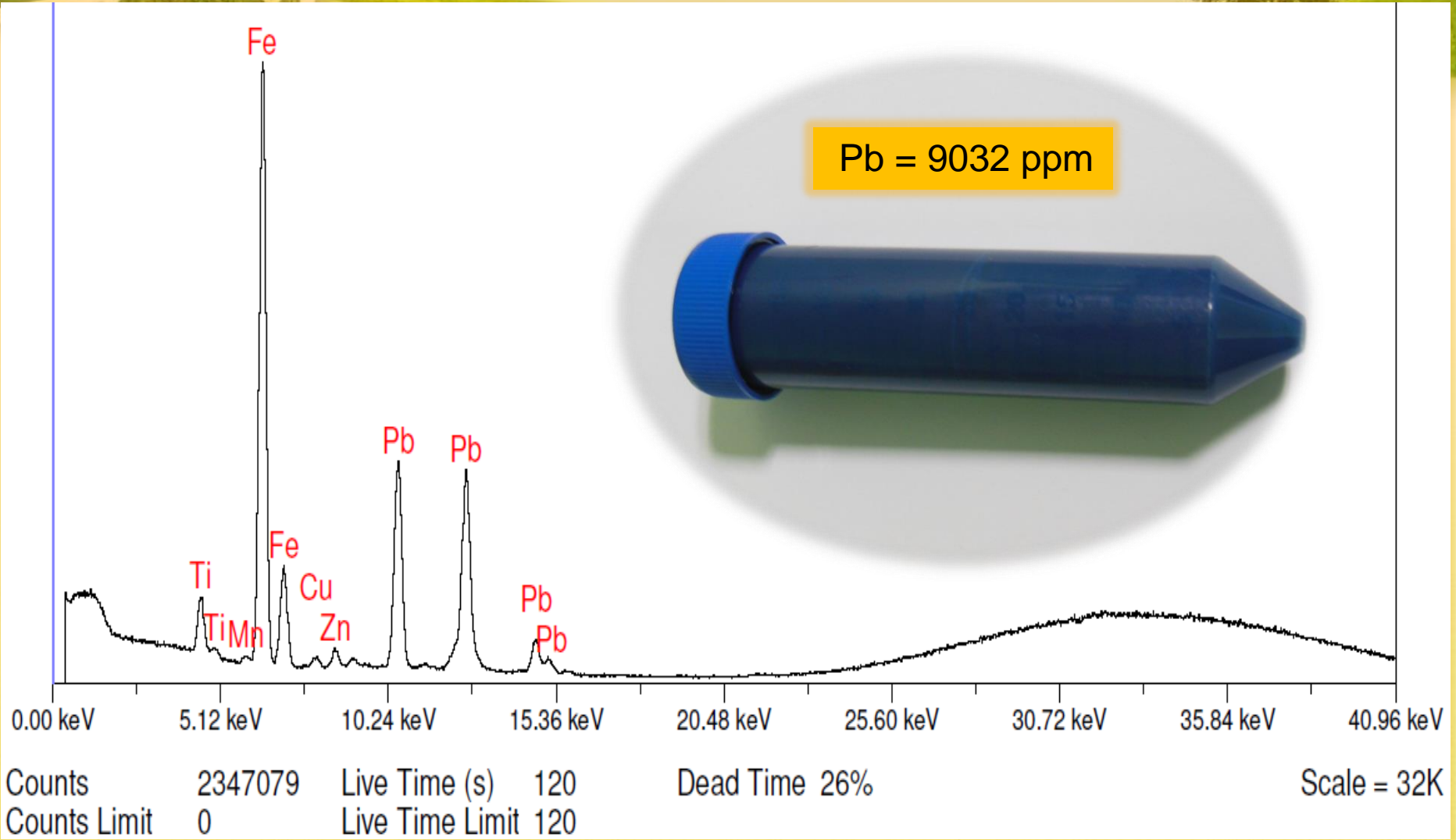


Black paints

Pb = 5917 ppm

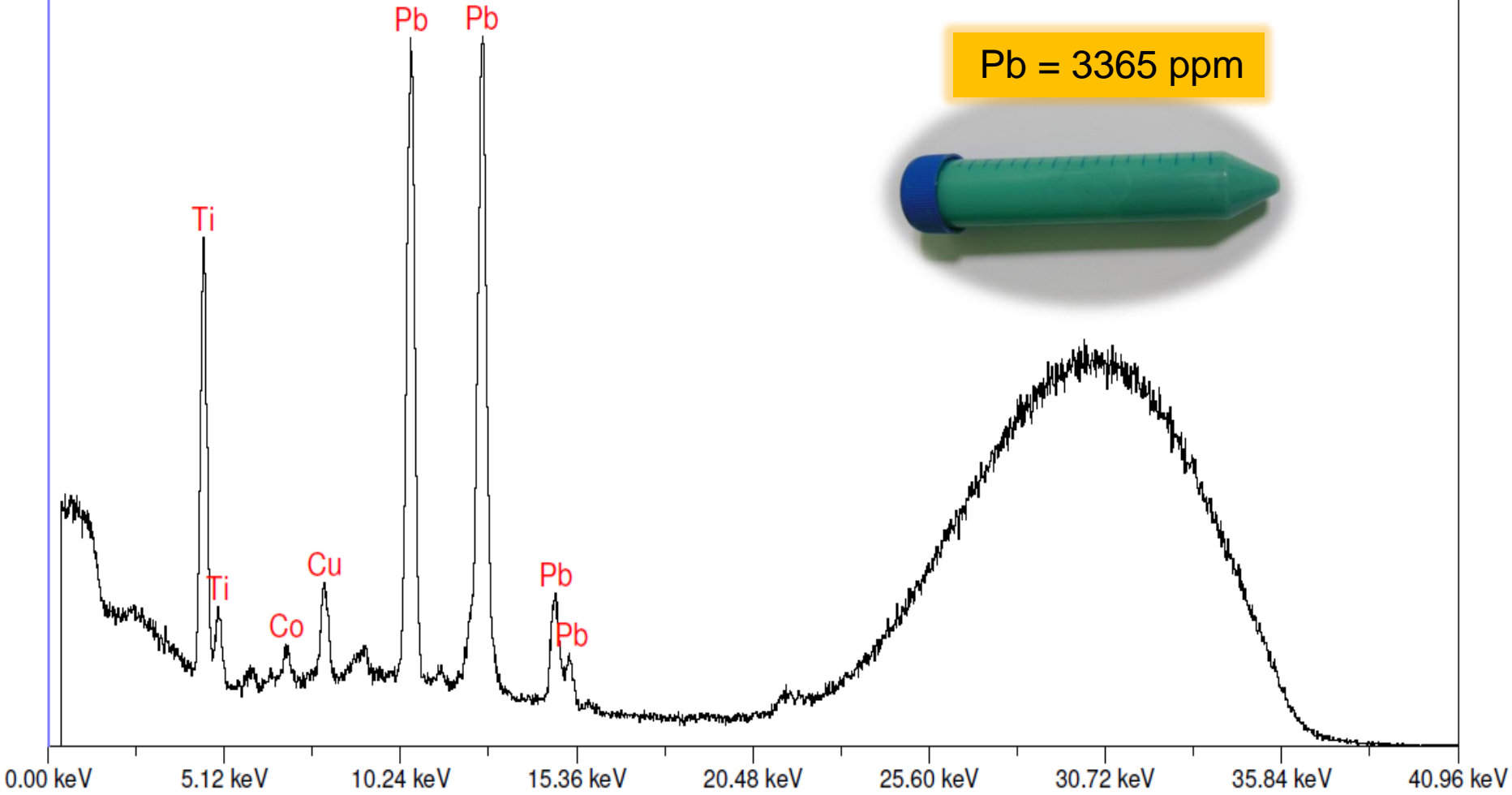


Blue paint



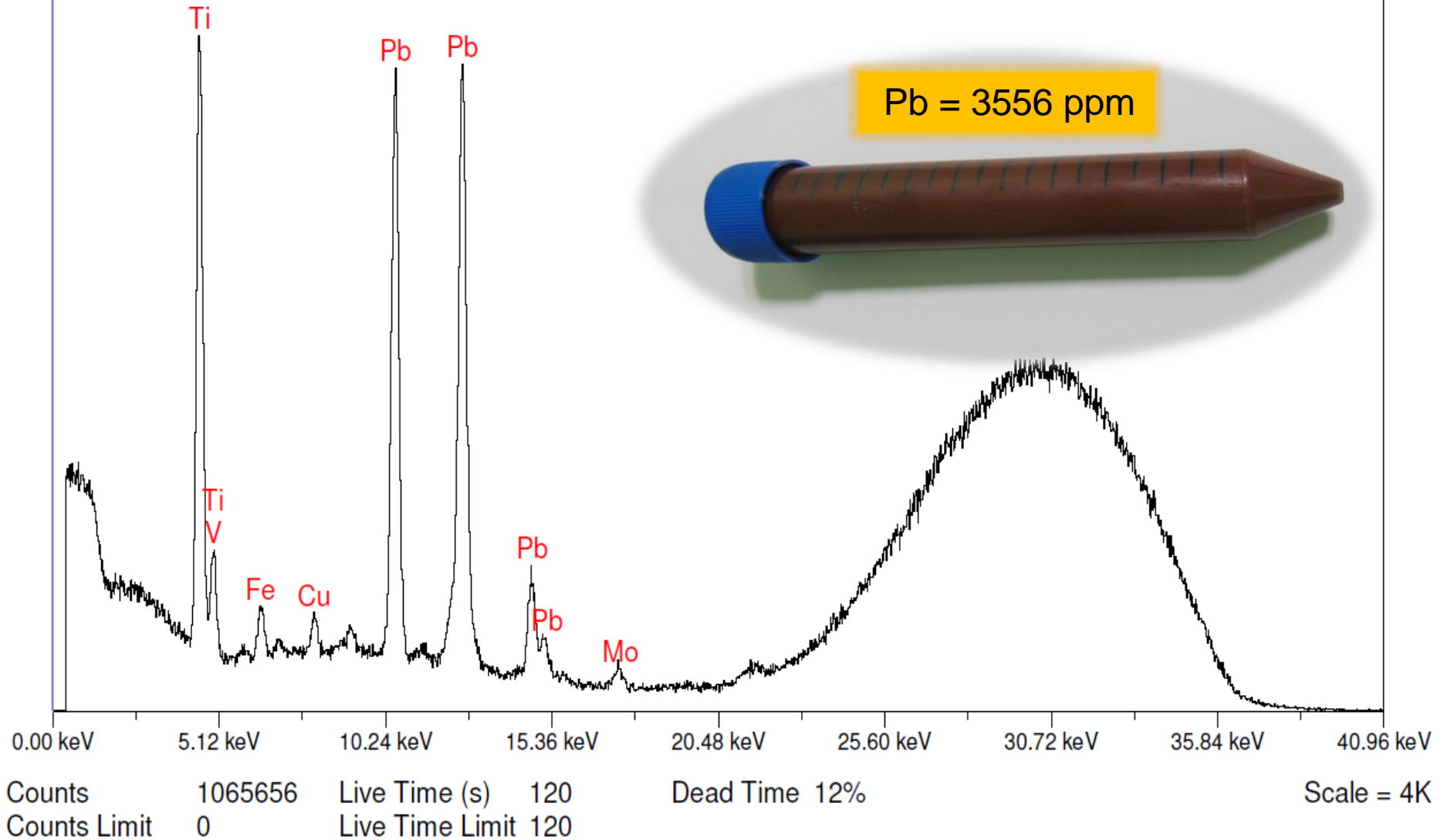
Green paint

Pb = 3365 ppm



Counts	1100815	Live Time (s)	120	Dead Time	8%	Scale = 4K
Counts Limit	0	Live Time Limit	120			

Grey paint



Extension of NABL accreditation up to Sep. 26, 2025



रा.प्र.प्र.बो.

राष्ट्रीय परीक्षण और अंशशोधन
प्रयोगशाला प्रत्यायन बोर्ड
विज्ञान एवं प्रौद्योगिकी विभाग, भारत
प्रत्यायन प्रमाण-पत्र

सेन्टर फॉर मेटिरियल्स फॉर इलेक्ट्रॉनिक्स टेक्नोलॉजी (सी-मेट), एनालिटिकल डिविजन
का मूल्यांकन और प्रत्यायन निम्न मानक के अनुसार
आई.एस.ओ./आई.ई.सी. 17025:2005
“परीक्षण एवं अंशशोधन प्रयोगशालाओं की मरम्मत की सामान्य अपेक्षाएँ”
हैदराबाद, तेलंगाना
में स्थित इसकी सुविधाओं के लिए
रासायनिक परीक्षण
के विषय क्षेत्र में किया गया।

(इस प्रयोगशाला के प्रत्यायन के विषय क्षेत्र की जानकारी एन ए सी एन वेबसाइट www.nabl-india.org से भी प्राप्त कर सकते हैं।)

प्रमाण-पत्र संख्या प-1780
जारी करने की तिथि 28/06/2014



वैधता की तिथि 27/06/2016

यह प्रमाण-पत्र उपर्युक्त मानक तथा राष्ट्रीय परीक्षण और अंशशोधन प्रयोगशाला प्रत्यायन बोर्ड की अतिरिक्त अपेक्षाओं का निरंतर संतोषप्रद अनुपालन किए जाने पर अनुबंध में निर्दिष्टानुसार प्रत्यायन के क्षेत्र के लिए वैध रहेगा।

रा.प्र.प्र.बो. की ओर से हस्ताक्षरित

जॉन वरगुसेस
कार्यक्रम प्रबन्धक

अनिल रेलिया
निदेशक

प्रो. के. विजयराघवन
अध्यक्ष



NABL

National Accreditation Board for
Testing and Calibration Laboratories
Department of Science & Technology, India

CERTIFICATE OF ACCREDITATION

CENTRE FOR MATERIALS FOR ELECTRONICS TECHNOLOGY (C-MET), ANALYTICAL DIVISION

has been assessed and accredited in accordance with the standard
ISO/IEC 17025:2005

“General Requirements for the Competence of Testing & Calibration Laboratories”

for its facilities at

IDA Phase, III, Cherlapally, HCL (Post), Hyderabad, Telangana

in the discipline of

CHEMICAL TESTING

(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Certificate Number T-1780

Issue Date 28/06/2014



Valid Until 27/06/2016

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the additional requirements of NABL.

Signed for and on behalf of NABL

John Varughese
Program Manager

Anil Rella
Director

Prof. K. VijayRaghavan
Chairman

What does RoHS compliant mean?

RoHS compliance means that a product has been tested for 10 banned substances by an independent authority, and that the tests confirmed levels of the substances below the **RoHS** threshold.

How Can Your Company Become RoHS Compliant ?

To meet RoHS standards, you must undergo four steps:

1. **Testing**—on-site or remotely, via XRF or lab equipment
2. **Process auditing**—ensuring all manufacturing adheres to restrictions and guidelines on-site
3. **Documentation review**—companies submit technical assessments of materials, drawings, test reports, and compliance certificates. A technical file is required.
4. **Certification statement**—an RoHS certificate of compliance is issued.

Summary status (1)



- **No exact or drop-in replacement**
- **Several alternative materials have been recommended for each of the banned materials.**
- **There is not yet much field data available for the new materials.**
- **Most of the cases, the alternative materials are costly and inferior in performance.**
- **More R & D is needed in near future.**

Summary status (2)

- ❑ There has been a substantial amount of money spent by industry to be in compliance with RoHS.
- ❑ Customer requirements are having a significant impact on industry and harmonization of requirements is encouraged.
- ❑ Additional RoHS laws or changes to the existing RoHS law by including some more hazardous chemicals would have a heavy impact on industry.

Suggested Solution

1. Safe recycling of existing e-waste
2. Strict implementation of RoHS regulations
3. Personal realization and discipline in using “emerging materials and devices”