

## **Characterization of the fine fraction of the Municipal Solid Waste Incineration Bottom Ash (MSW IBA) focused in the metal recovery.**

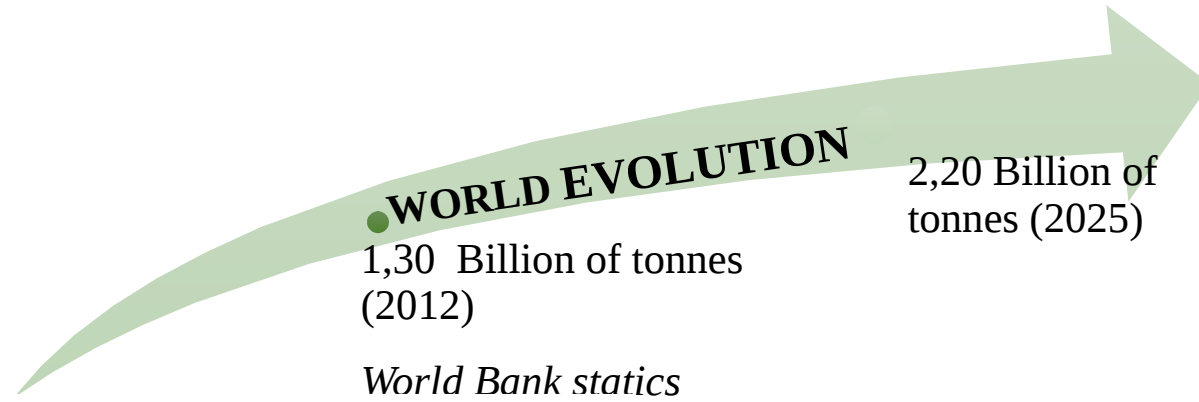
Héctor Muñiz Sierra, Michal Šyc, Jakub  
Výravský



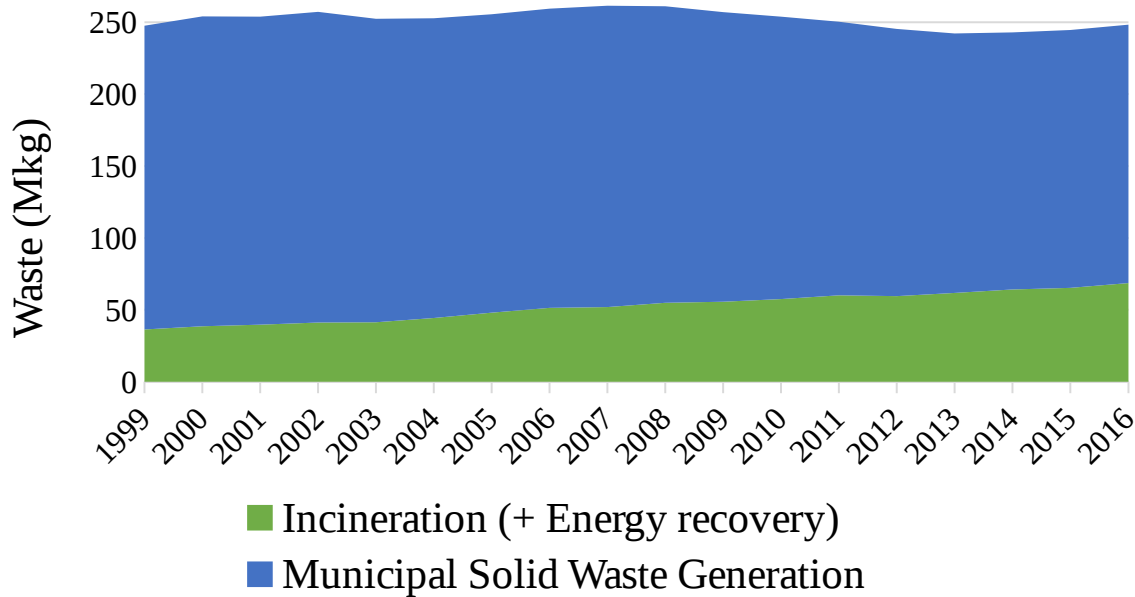
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PROCESS FUNDAMENTALS  
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# MUNICIPAL SOLID WASTE GENERATION



## EU-28 Municipal Solid Waste Generation



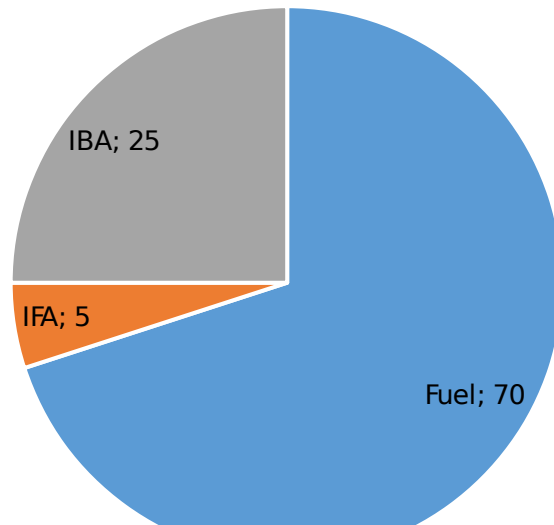
**Waste Generation: +0,3%**

**Incineration Technology: +89,1%**



## Incineration Fly Ash (IFA):

- ✓ Light and/or fine particles.
- ✓ Material mixture with an relatively high presence of chloride salts and heavy metals.
- ✓ Control: Heavy metals leachability



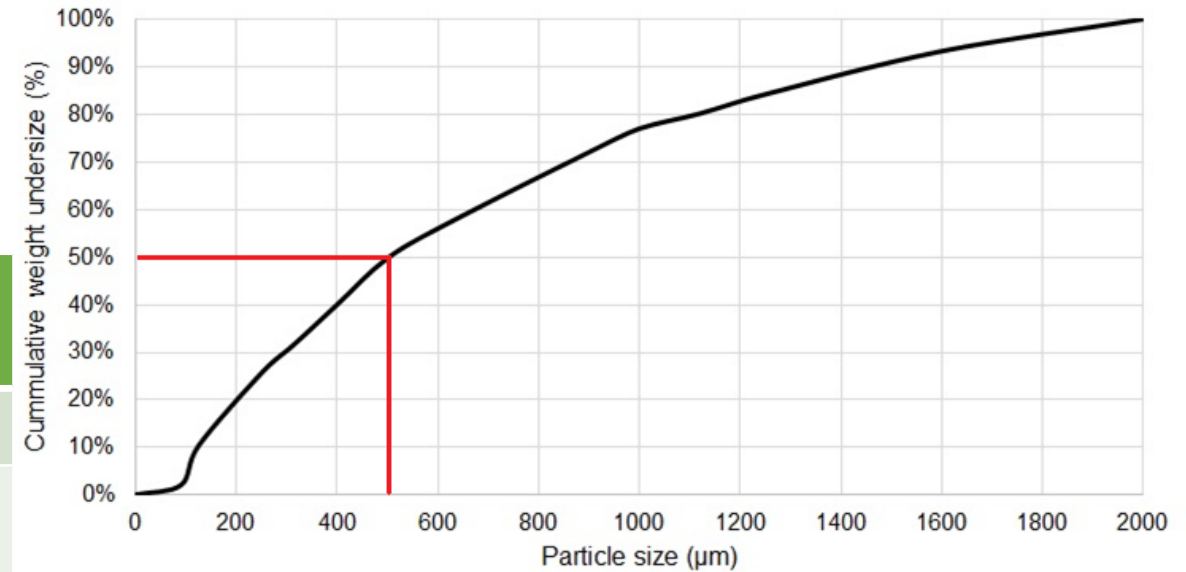
## Incineration Bottom Ash (IBA):

- ✓ Large and/or heavier particles.
- ✓ Non-hazardous residue composed by a mix of glass, minerals and metals.

# INCINERATION BOTTOM ASH (IBA)

**IBA Fine Fraction, up to 2 millimeters,  
 is 35% wt. of the total IBA Weight**

Composition	WtE Prague	WtE Liberec	WtE Brno
Glass	14-23	9-12	14,8
Ceramic and Porcelain	2,0-5,0	2,0-3,0	3,6
Unburned org. Matter	0,2-0,6	0,5-1,0	0,2
Magnetic fraction	11-16	14-17	10,2
Ferrous scrap	8,5-10,5	6,0-7,0	11,0
Non-ferrous metals	1,6-2,2	1,3-1,5	2,8
Residual fraction	20-26	25-29	20,5
<i>Particles &lt; 2 mm</i>	<i>30-35</i>	<i>33-36</i>	<i>36,8</i>



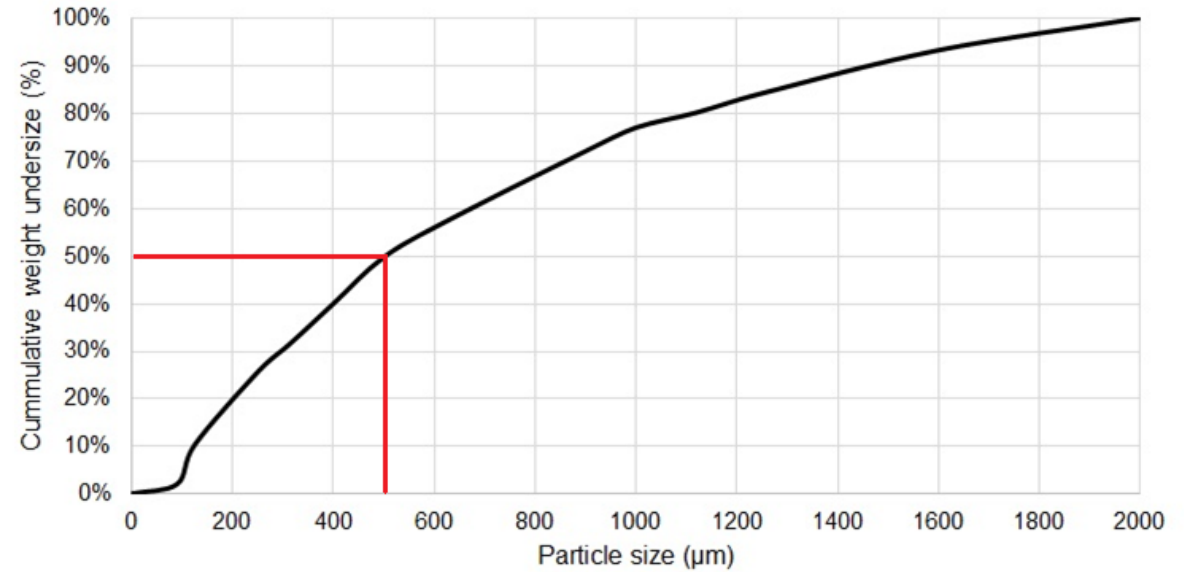
Particle size	Fraction
<100µm	04,5%
100-500µm	43,5%
500-1000µm	28,0%
1000-2000µm	23,0%

## IBA Fine Fraction < 2mm

**IBA Fine Fraction, up to 2 millimeters,  
 is 35% wt. of the total IBA Weight**

Particle size	Fraction
<100µm	04,5%
100-500µm	43,5%
500-1000µm	28,0%
1000-2000µm	24,0%

- ✓ Aluminum ≈ 1,5g/kg 1840\$/ton.
- ✓ Cupper ≈ 0,6g/kg 5860\$/ton.



### SEPARATION FACTORS

1. Amount of material
2. Metals grains: size and shape
3. Liberation rate

# INCINERATION BOTTOM ASH (IBA)

## **TIMA Analyzer:**

TESCAN Integrated Mineral Analyzer



BSE & EDS analysis  
(other tools)

+

TIMA Software

Chemical analysis:

- Elemental composition,
- Native metals,
- Mineral phases.

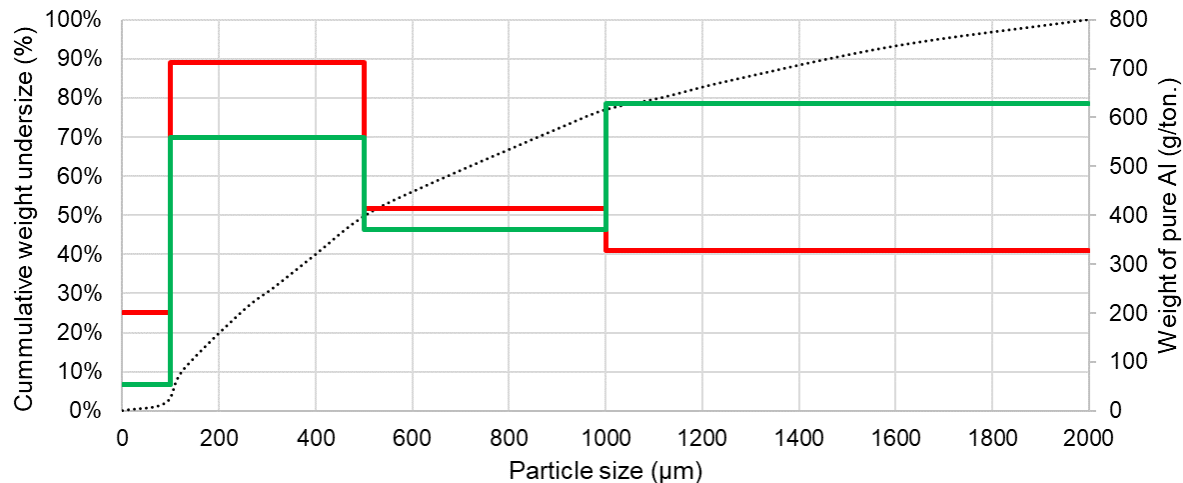
Optical analysis:

- Particle/Grain size (ECD)
- Particle/Grain shape
- Liberation rate



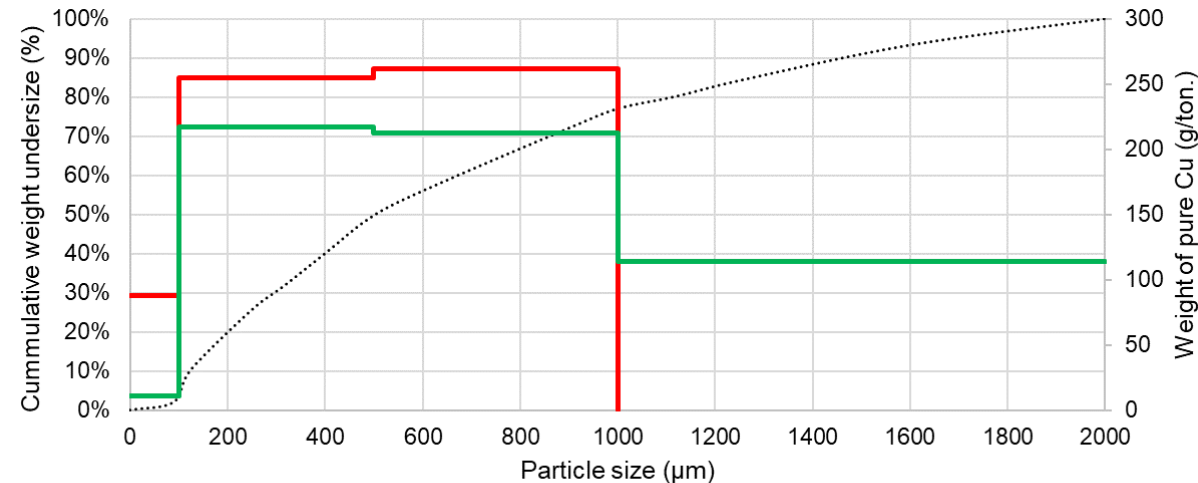
# IBA fine fraction: Amount of pure metals

## Aluminum



..... Granulometric Distribution    — Grain Size    — Particle size

## Copper

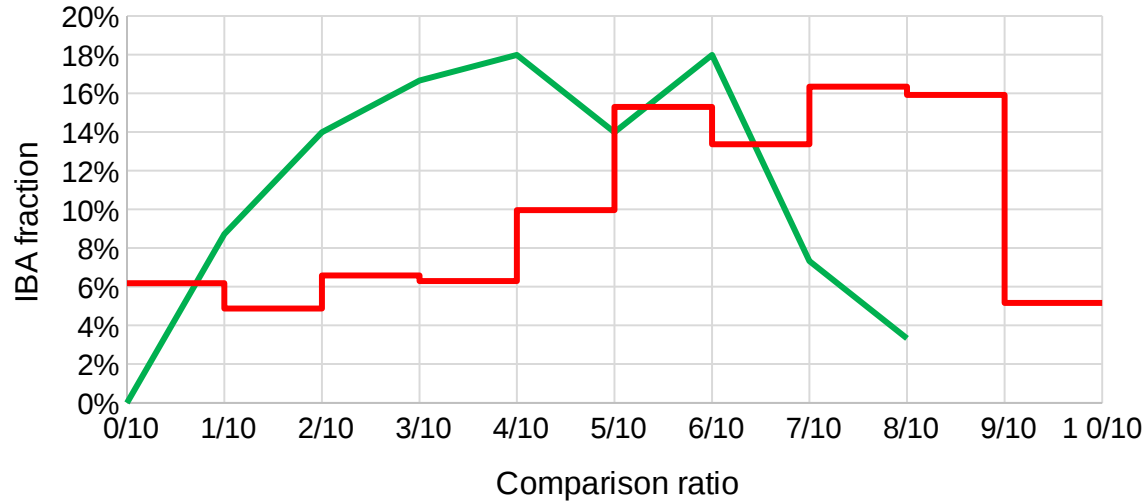


..... Granulometric Distribution    — Cu grains    — Particles with Cu

	Aluminum			Copper		
	Concentration (g/kg.)	Particle size (% <sub>wt.</sub> )	Grain size (% <sub>wt.</sub> )	Concentration (g/kg.)	Particle size (% <sub>wt.</sub> )	Grain size (% <sub>wt.</sub> )
< 100µm	1,63	4,5	12,1	0,62	4,88	14,55
100-500µm	1,28	34,25	43,1	0,50	37,95	42,15
500-1000µm	1,32	22,71	25,0	0,76	37,20	43,31
1000-2000µm	2,62	38,54	19,8	0,60	19,94	n.d
weight	1,65 g/kg.			0,57 g/kg.		

# IBA fine fraction: Liberation and Shape

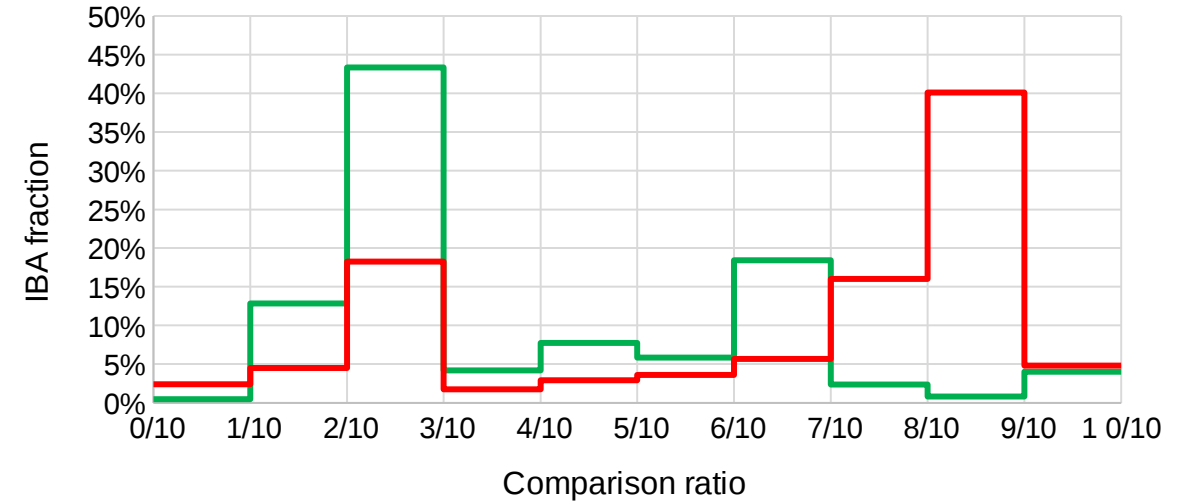
## Aluminum



— Liberation Ratio (vol.) — Elipse ratio (wt.)



## Conner

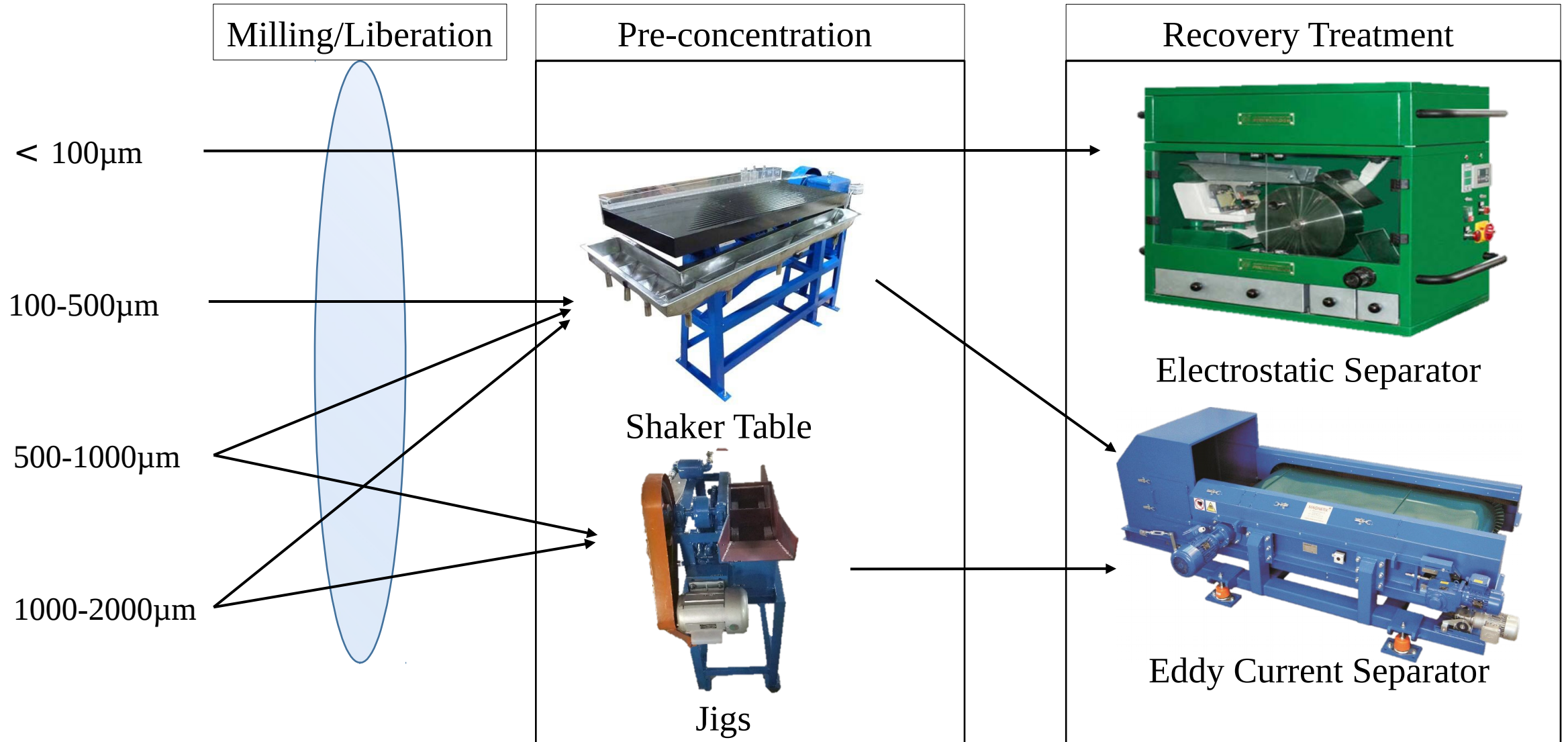


— Liberation Ratio (vol.) — Ellipse ratio (wt.)





# IBA fine fraction: RECOVERY TREATMENTS





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## **THANK YOU FOR YOUR ATTENTION**