10% Metallurgy

Session 2

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Learning Objectives

- Terms
- Metallurgy Process (Brief Overview)

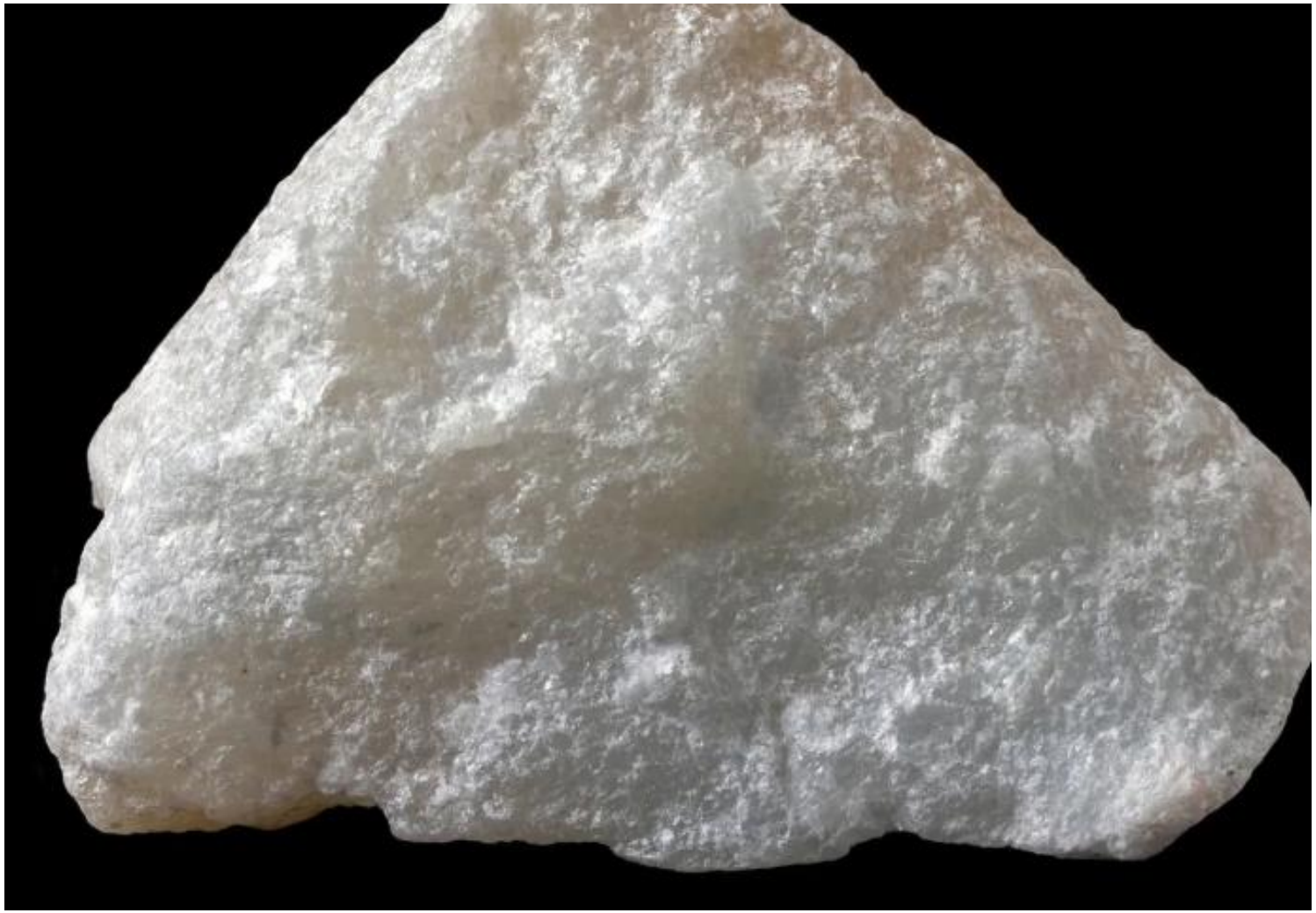
1. Minerals

- are SOLID SUBSTANCES
- that are present in NATURE and
- can be made of ONE ELEMENT OR MORE ELEMENTS

1. Minerals: *Limestone*

PC: *SHC Group Company*

1. Minerals: *Talc*



PC: *britannica.com*

1. Minerals: *Gypsum*

PC : *Eisco Labs*

1. Minerals: *Quartzite*

PC : *ThoughtsCo*

1. Minerals: *Granite*

PC : *Geology.com*

1. Minerals: *Marble*

PC : Mindat.org

1. Minerals: *Dolomite*

PC : Wikipedia

1. Minerals: *Coal*

PC : Wikipedia

2. Ores

- is a MINERAL
- which contains ENOUGH amount of certain METALS
- which can be profitably EXTRACTED from it

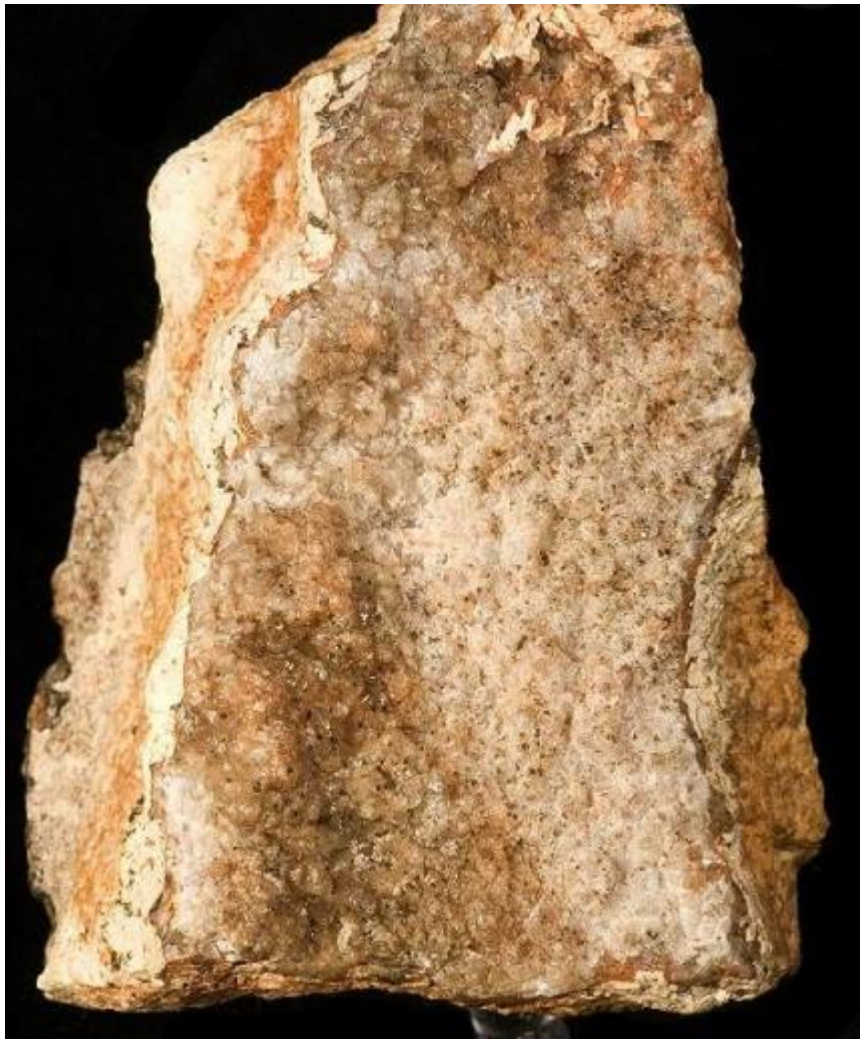
2. Ores: Bauxite [$Al_2O_3.2H_2O$]

PC : Hydro.com

2. Ores: Cuprite [Cu_2O]

PC : Minerals.net

2. Ores: Calamine [$ZnCO_3$]

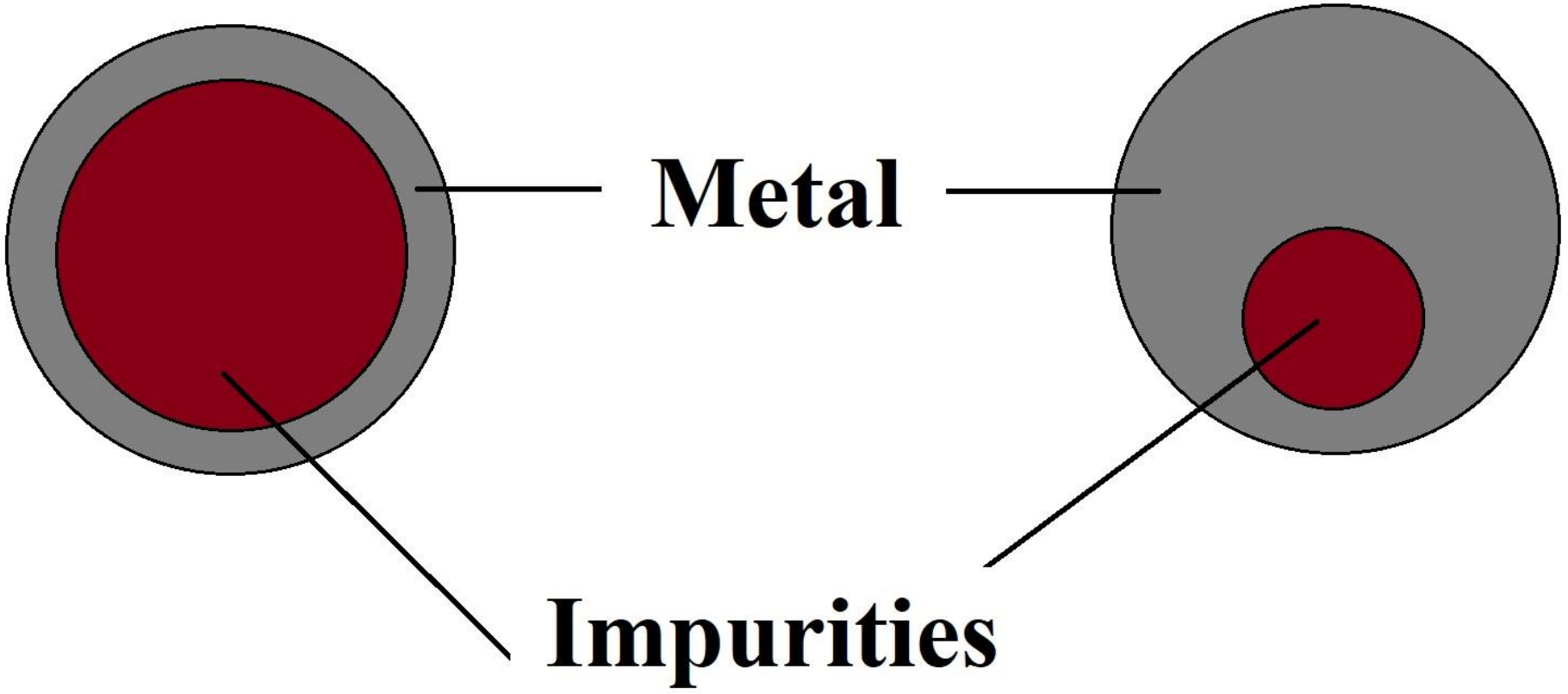


PC : wikipedia

2. Ores: Galena [PbS]

PC : Amazon.com

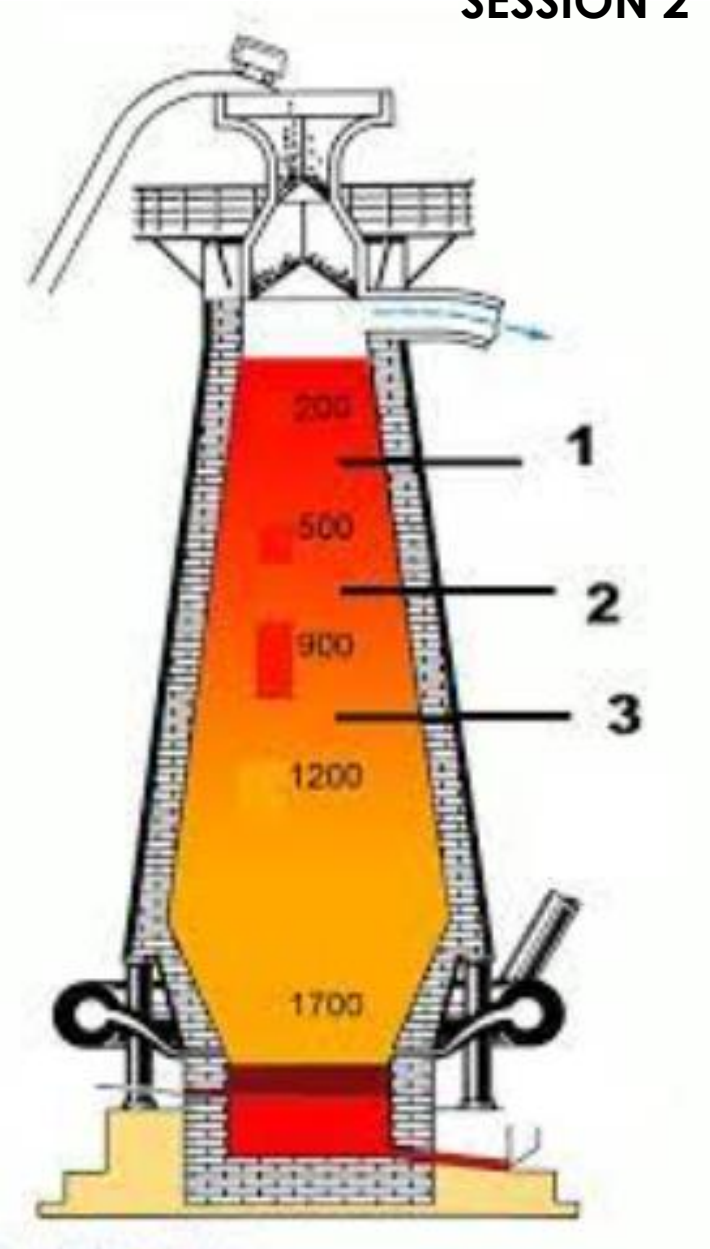
Mineral vs Ore



- Mineral
- But Not Ore

- Mineral
- Ore

3. Furnace



PC : Thermal Processing Magazine and Electrical Engineering Stack Exchange

4. Flux

- is a CHEMICAL SUBSTANCE
- ADDED to an ore during the extraction of metal
- that COMBINES chemically with the GANGUE
- to form LIGHT MASS

KCl (Potassium Chloride)

PC : IndiaMart

5. Gangue/Matrix

- **IMPURITIES**
- **like sand, rocky materials associated with ore**

(a) coal

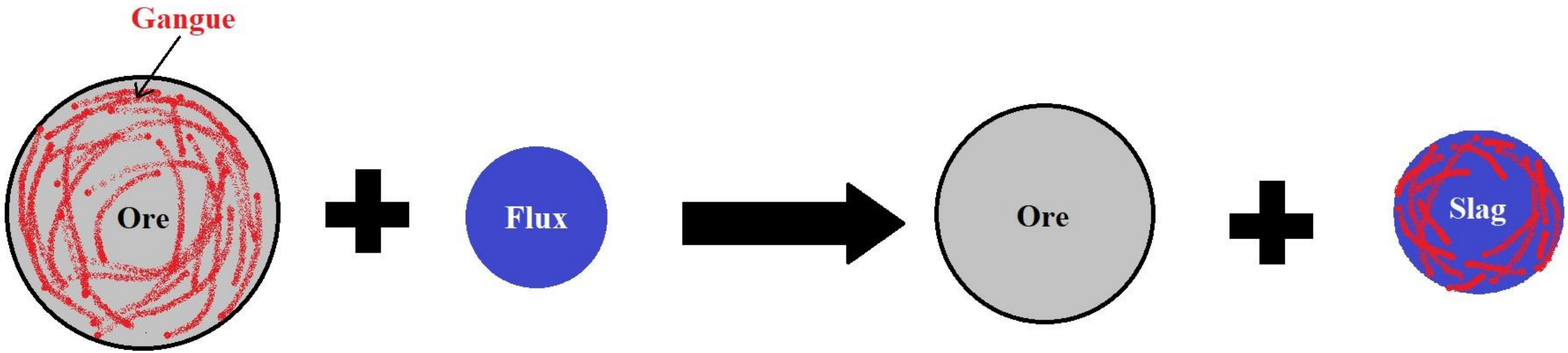
(b) gangue

PC : Semantic Scholar

6. Slag

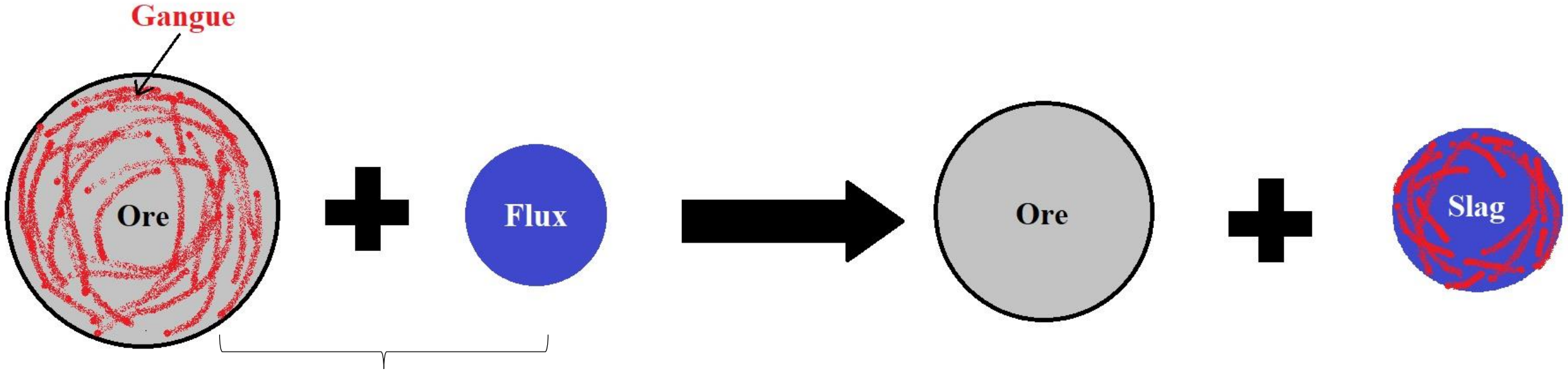
- The PRODUCT obtained
- by the COMBINATION of *GANGUE* with the *FLUX*

PC : Berthold Technologies


Gangue
Ore
Flux
Ore
Slag

7. Charge

- the MIXTURE of materials
- FED into a furnace,
- to EXTRACT a metal.



4 Steps

to Extract Metals

Step 1: Dressing of Ores

a. Hand Picking

b. Crushing and Grinding of Ore

Step 2: Concentration of Ores

a. Froth Floatation Process
b. Gravity Separation or Levitation
c. Magnetic Separation
d. Leaching

Step 3: Extraction of Metals from the Concentrated Ore

a. Conversion of Ores into Metal Oxides

i. Calcination
ii. Roasting

b. Reduction to Metal from Metal Oxide

i. Pyrometallurgy: The carbon reduction process
ii. Aluminothermy: Reduction with aluminium
iii. Auto-reduction
iv. Electrolytic Reduction

Step 4: Purification or Refining of Metal

a. Liquation
b. Distillation Method
c. Electrolytic Refining
d. Oxidative Refining

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