中南大學
CENTRAL SOUTH UNIVERSITY

Unit 5 Ore dressing

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School of Metallurgy and Environment

New words and expressions

- concentrate /'kɒns(ə)ntreit/ v. 富集，浓缩，集聚；n. 精矿，浓缩物
- concentration / kɒns(ə)n'treiʃ(ə)n / n. 浓度，集中，浓缩
- bulk / bʌlk /n. 正体，主体，团块
- gangue / gæŋ /n. 脉石，尾矿，矿脉中的夹杂物
- tailing / 'teiliŋ /n. 尾矿
- severance / ˈsevərəns /n. 分离，隔离，碎散
- beneficiation / beni,fiʃi'eiʃən /n. 选矿
- comminution / ˌkɒmi'nju:ʃən /n. 粉碎
- middling / 'mid(ə)liŋ /n. 中矿
- liberation / libə'reiʃ(ə)n /n. 解离

New words and expressions

- crush / krʌʃ /n. v.粉碎， 碾碎， 挤压
- grind / graind /n. v. 磨碎， 研磨， 磨细
- screen / skri:n /n. v. 筛， 筛分
- jigging / 'dʒigiŋ /n.跳选， 跳汰选
- luster /'lʌstə/n. 光泽； 光彩； v.闪光， 发光
- fracture /'fræktʃə/n.断口， 裂缝
- magnitude/'mægnitju:d /大小； 量级;强度， 等级
- medium/ 'mi:diəm /n. 介质， 媒介， 中间物， 培养基
- dilate/ dai'leit/v. 扩大； 膨胀； dilation/ dai'leiʃən/扩张， 扩大； 膨胀系数
- lip /lip/ n. 凸出部分， 边缘
- table n. 摇床， 淘汰盘； tabling摇床选， 淘汰选
- motion n. 运动， 输送， 行程， 机械装置， 运动机构
- circumference/ sə'kʌmf(ə)r(ə)ns /n. 圆周； 周长

New words and expressions

- floatation/ fləʊ'teiʃən / n. 浮选
- pulp　n. 矿浆，浆料
- sluice / slu:s/ n. 水闸；蓄水；洗矿槽
- hematite/ 'hemətait/ n. 赤铁矿
- pyrolusite / pairə(ʊ)'lu:sait / 软锰矿
- ore dressing选矿
- acid concentration
- 酸浓度
- run-of-mine 原矿
- hand picking 手选
- specific gravity 比重
- magnetic permeability/ pɜ:miə'biliti / 磁导率
- inductive charging 感应电荷
- electrostatic separation 静电分离

- automatic sorting of radioactive natures 放射性自动选矿
- magnetic separation磁选
- magnetic field磁场
- gravity concentration重力选矿
- sink-float separation 重介质分选
- diladilateddilateted bed 松散床层
- rotating motion 旋转装置，旋转设备
- froth flotation 泡沫浮选
- dehydration [,di:haɪ‘dreɪʃən]脱水

- Ore dressing
- Severance解离
  - Comminution:crushing破碎, grinding粉磨
  - Screen:sizing
- Beneficiation分选
  - Selection(hand picking)
  - Separation methods
    - Magnetic separation
    - Gravity concentration
    - Jigging
    - Tabling
    - Sink-float separation
    - flotation

- 连续动作的描写
- 范围的描写
- Post attributive（后置定语）

1. 定语从句

2. 短语：
   - 介词短语
   - 非谓语动词短语
     - 不定式短语
     - 现在分词短语V-ing
     - 过去分词短语V-ed

3. 单个词

放在被修饰词的后面，用来修饰这个名词或代词

选矿基本过程

一、分选前的准备作业

- 包括原矿原煤的破碎、筛分、磨矿、分级等工序。本过程的目的是使有用矿物与脉石矿物单体分离，使各种有用矿物相互间单体解离。

二、分选作业

- 借助于重选、磁选、电选、浮选和其他选矿方法将有用矿物同脉石分离，并使有用矿物相互分离获得最终选矿产品精矿、尾矿，有时还产出中矿)。

三、选后产品的处理作业

- 包括各种精矿、尾矿产品的脱水，细粒物料的沉淀浓缩、过滤、干燥和洗水澄清循环复用等。

- Ore dressing concerns with the technology of treatment of ores to concentrate their valuable constituents (minerals) into products (concentrate) of smaller bulk, and simultaneously to collect the worthless material (gangue) into discardable waste (tailing).
- The fundamental operations of ore-dressing processes are the breaking apart of the associated constituents of the ore by mechanical means (severance) and the separation of the severed components (beneficiation) into concentrate and tailing, using mechanical or physical methods which do not affect substantial chemical changes.

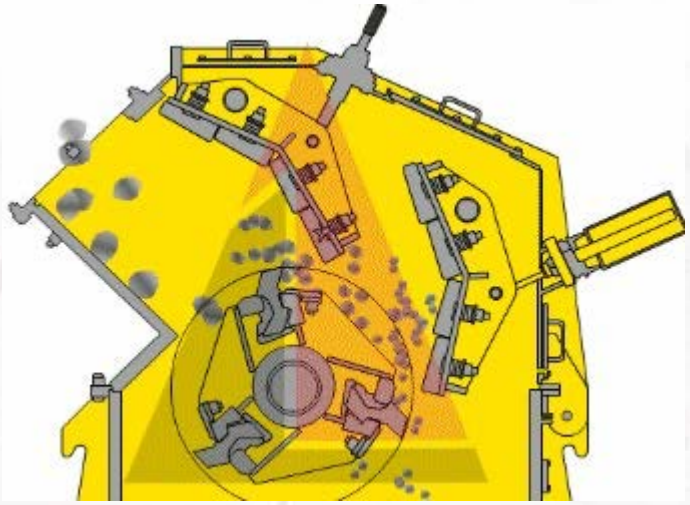
Comminution is divided into:

- crushing (from run-of-mine size to 6- 14 mush)
  - coarse crushing, or coarser;
  - intermediate crushing;
  - fine crushing.
- grinding (down to micron size)

Screening——is a method of sizing

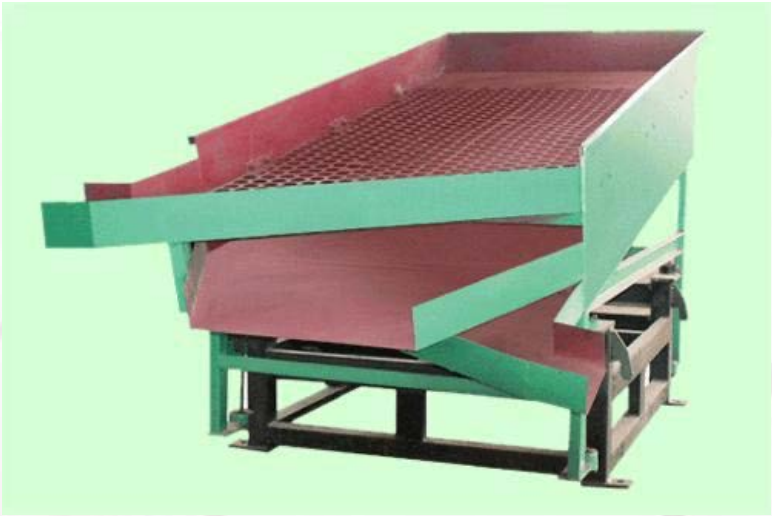
- Comminution is a single or multistage processes whereby ore is reduced from run-of-mine size to that size needed by the beneficiation processes.

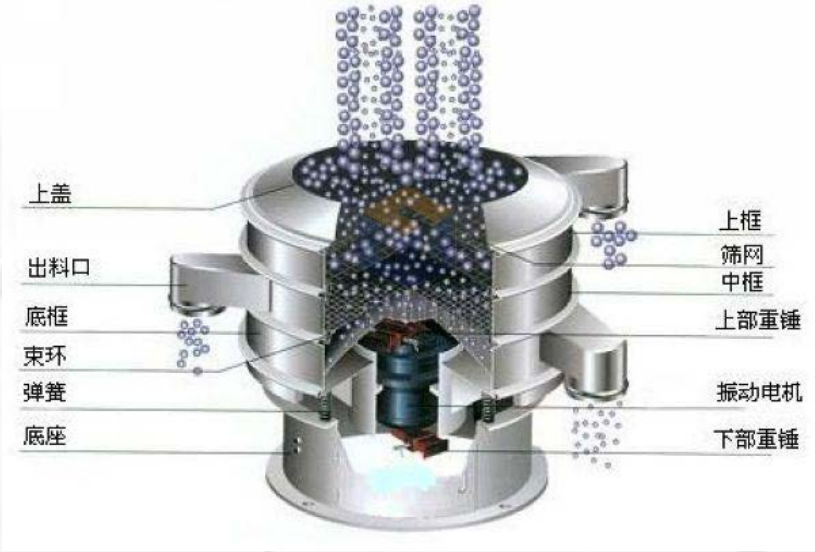
- The process is intended to detailed control, a class of particles containing both mineral and gangue (middling particles) are also produced. The smaller the percentage of middling the greater the degree of liberation.



- Screen is a method of sizing whereby graded products are produced, the individual particles in each grade being of nearly the same size. With可以替换being of
- In beneficiation, screening is practiced for two reasons: as an integral part of the separation process, for example jigging, and to produce a feed of such size range as is compatible with the applicability of the separation process.

is compatible with：与。。。。相配套





Two fundamental operations: selection and separation

- the determination that an individual particle is either a mineral or a gangue particle (selection);
- the movement of selected particles via different paths (separation) into the concentrate and tailing products.

When middling particles occur, they will either be selected according to their mineral content and then caused to report as concentrate or tailing, or be separated as a third product (middling). In the latter case, the middling is reground粉磨 to achieve further liberation, and the product is fed back into the stream of material being treated.

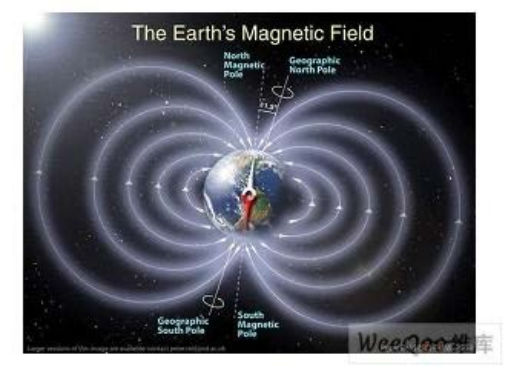
- Selections based upon some physical or chemical property in which the mineral and gangue particles differ in kind or degree or both.

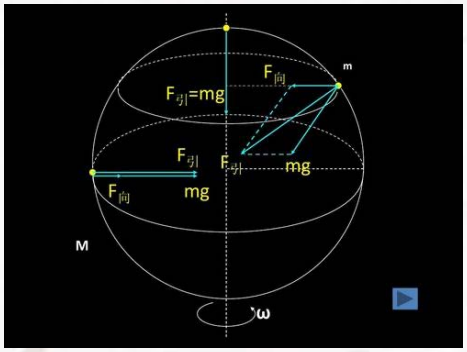
- Use is made of differences in other physical or chemical properties, such as specific gravity, magnetic permeability, inductive charging (electrostatic separation), surface chemical properties, bulk chemical properties, weak planes of fracture (separation by screening), and gamma-ray emission (automatic sorting of radioactive nature).

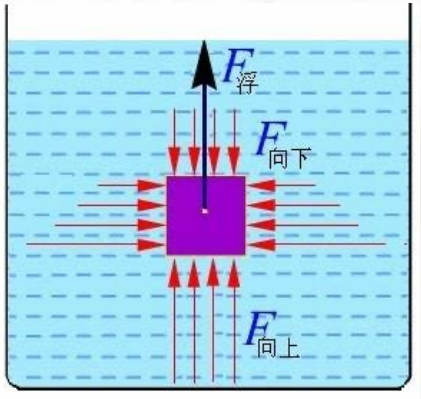


- Separation is achieved by subjecting each particle of the mixture to a set of forces that is usually the same irrespective of the nature of the particles excepting for the force based upon the discriminating property. 有差异的

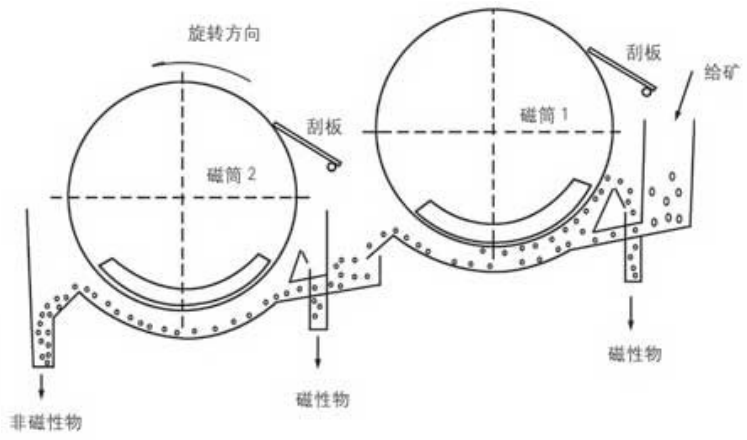
- This force may be present for both mineral and gangue particles but differing in magnitude, or it may be present for one type of particle and absent for the other. As a result of this difference separation is possible, and the particles are collected as concentrate or tailing.







1. Magnetic separation（磁选）



工作原理图

- Magnetic separation utilizes the force exerted by a magnetic field upon magnetic materials to counteract partially or wholly the effect of gravity.
- Thus under the action of these two forces different paths are produced for the magnetic and nonmagnetic particles.

2. Gravity concentration（重选）

- Gravity concentration is based on a discriminating force, the magnitude of which varies with specific gravity.
- The other force that is usually operating in gravity methods is the resistance to relative motion exerted upon the particles by the fluid or semifluid medium in which separation takes place.

- 2.1 Jigging（跳汰选矿）
- 2.2 Tabling（摇床选矿）
- 2.3 Sink-float separation（重介质分选）

2.1 Jigging（跳汰选矿）

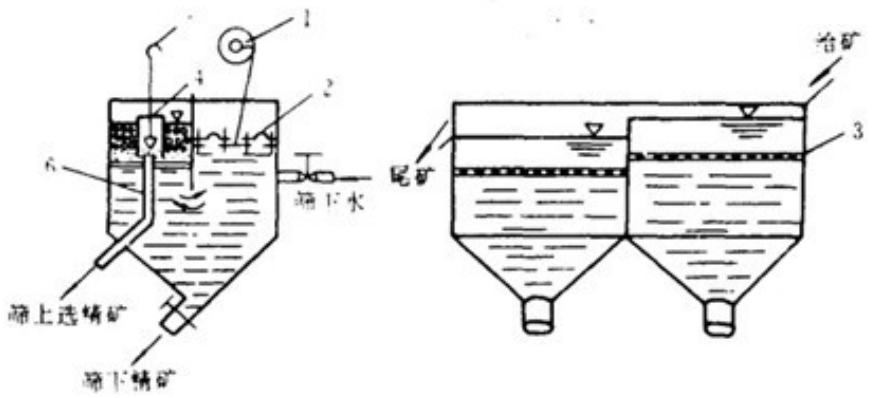


图 3-8 隔膜跳汰机分选示意图

1 偏心机构；2 隔膜；3 筛板；4 外套筒；5 锥形阀；6 内套筒

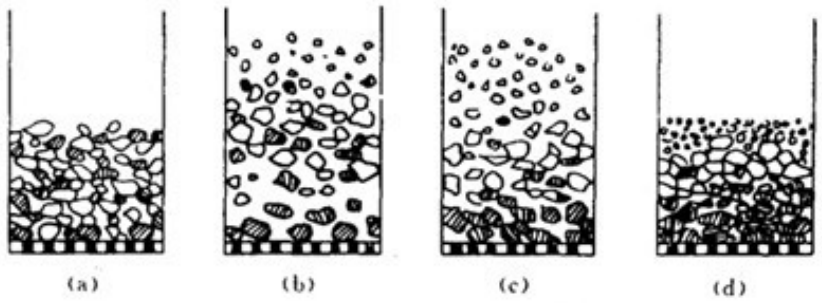


图 3-9 矿粒在跳汰时的分层过程

(a)分层前颗粒混杂堆积；(b)上升水流将床层抬起；(c)颗粒在水流中沉降分层；(d)下降水流，床层紧密，重矿粒进入底层

- Jigging is a gravity method that separates mineral from gangue particle by utilizing an effective difference in settling rate through a periodically dilated bed.
- During the dilation heavier particles work their way to the bottom while the lighter particles remain on top and are discharged over the lip.

动作的描写

2.2 Tabling（摇床选矿）

- Tabling is a gravity method in which the feed, introduced onto an inclined plane and reciprocated deck, moves in the direction of motion while simultaneously being washed by a water film which moves it also at right angles to the motion of the deck.

At right angle to 成直角

- The heavier mineral and the lighter gangue are usually collected over the edges of the deck.
- The boundary between the heavier mineral and lighter gangue particles is roughly a linear diagonal band on the deck of the table. This diagonal band is not stationary; rather it tends to move about a mean position. In practice therefore, a third product, the middling, is collected between the discharge edges of concentrate and gangue.

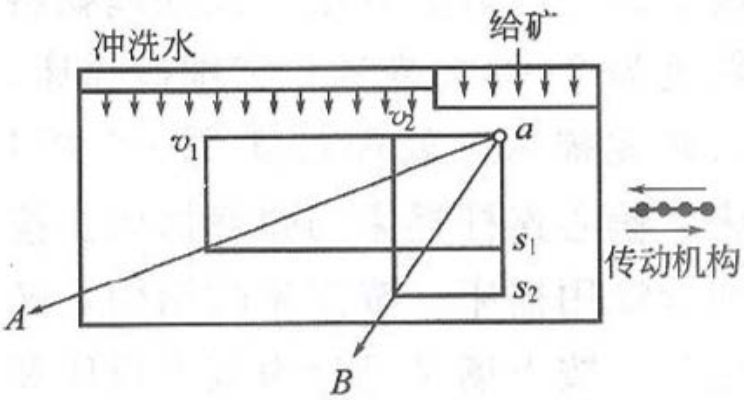


图 3-9 矿粒在床面上的运动图

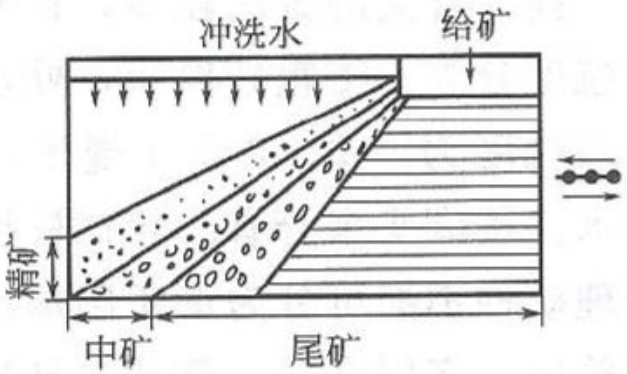


图 3-10 矿粒在摇床上的扇形分布图

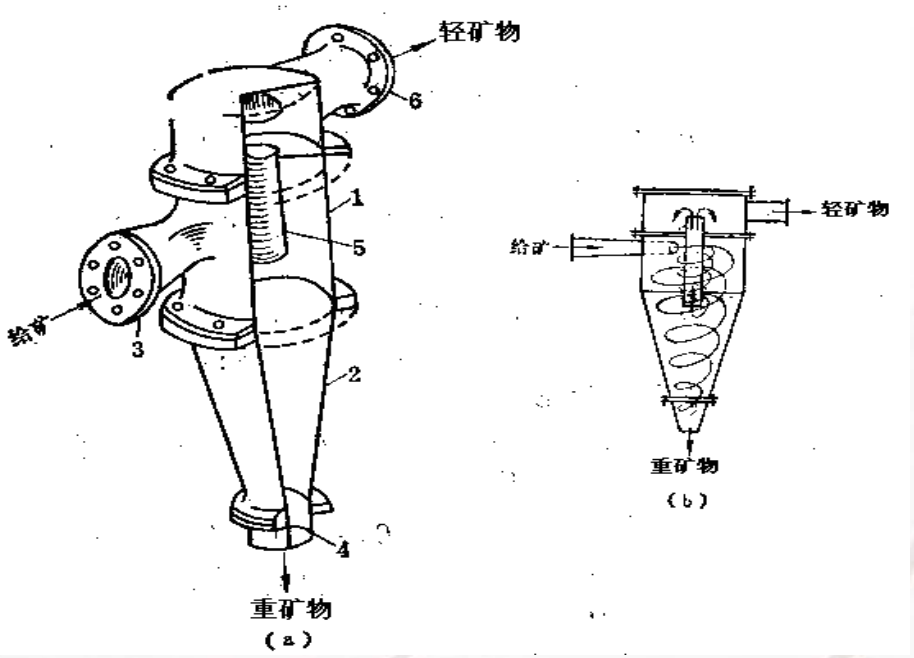
2.3 Sink-float separation（重介质分选）

- Sink-float separation is the simplest gravity method and is based on existing differences in specific gravity.
- The feed particles are introduced into a suspension, the specific gravity of which is between that of the mineral and gangue particles, with the result that particles of higher specific gravity sink while those of lower specific gravity float.

- The separator is a cone equipped with a slowly operated stirrer which serves to impart slow rotary motion to the suspension and prevent the suspension from settling out on the walls.

2.3 Sink-float separation（重介质分选）

- Feed is introduced at one point of the circumference and is slowly moved by the rotating motion of the suspension.

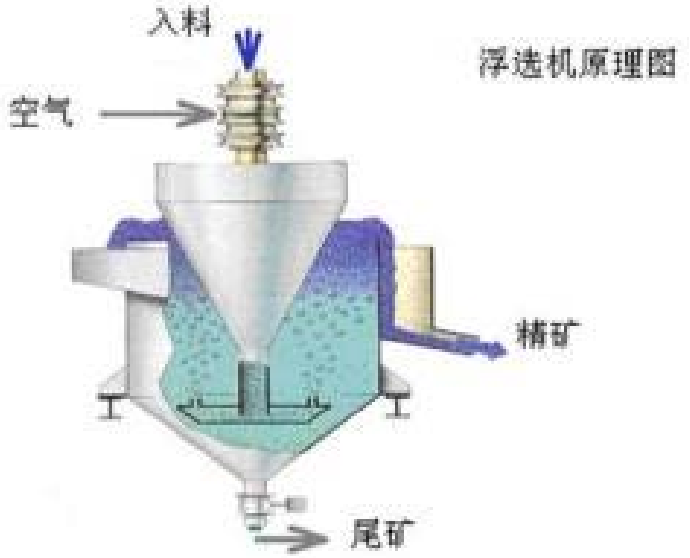


- By the time this material has reached the discharge point on the circumference, those particles whose specific gravity is greater than that of the suspension have moved down through the suspension so that only float particles are discharged at the top, the sink particles are discharged at the bottom.

3. Flotation（浮选）

- Flotation is used to separate valuable minerals from waste rock or gangue, in which the ground ore is suspended in water and, after chemical treatment, subjected to bubbles of air.
- The minerals that are to be floated attach to the air bubbles, rise through the suspension, and are removed with the froth that forms on top of the pulp.

悬浮液经过过滤，洗涤，烘干得到产品



Translation

- 新的操作系统应与现有硬件existing hardware兼容。Be compatible with
- 这对双胞胎长得很像，但性格差异大。
- 将黄铜矿chalcopyrite经过subject破碎，粉磨，然后浮选就得到了铜精矿，其品位通常为30-50%。

Answer to translation

- The suspension was filtered, washed and dried to obtain the product.
- The operating system is compatible with existing hardware.
- The twins look alike but differ in characters.
- Chalcopyrite is subjected to crushing, grinding and flotation to produce copper concentrate with grade ranging from 30-50%

Part	Content
Severance	comminution (crushing, grinding); screening
Beneficiation	selection; separation
Ore dressing methods	magnetic separation; gravity concentration (jigging; tabling; sink-float separation) ; flotation

Homework

Recite the words and phrases; Exercises Part II

THANKS

End

lecturer: Xiyun Yang

School of Metallurgy and Environment