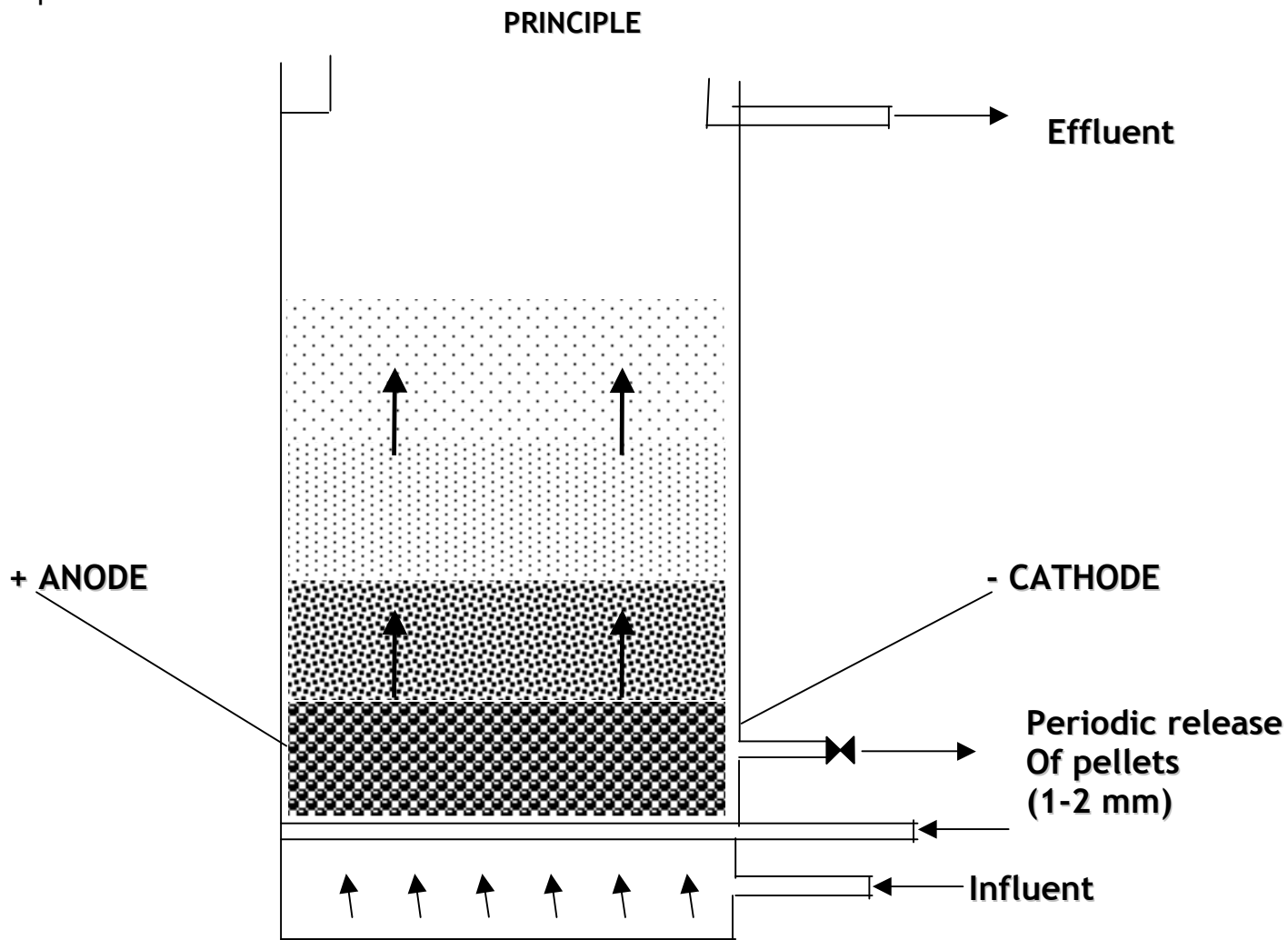


ELECTRO PELLET REACTOR

FEATURES OF ELECTRO PELLET REACTOR

- ◆ Fluidized bed reactor
- ◆ Partially filled with suitable seed materials. (Eg: Filter sand or minerals)
- ◆ Fluidization velocity is 40 - 120 m/hr
- ◆ Pellet Bed - kept in Fluidized state by feed and partial recirculation
- ◆ Sharp phase separation exists between the fluidized bed and the supernatant.



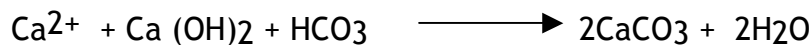
Working Principle:

- ◆ The anion or metal containing water and the reagent are injected at the bottom of the reactor and in some applications mixed with a circulation stream.
- ◆ Relatively large super saturation of the desired ions and the salt occurs at the bottom of the reactor.

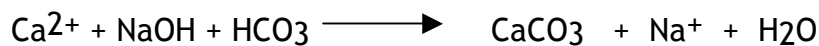
- ◆ Fluidized bed - provides a very large crystallization surface.
- ◆ Fast Controlled Reaction - All the anion or metal crystallizes on the pellets. Reaction will be enhanced by the electrode placed at the bottom of the reactor.
- ◆ Growth of Pellets and their movement to the bottom of the reactor occurs by their increase of weight.
- ◆ Periodical discharge of largest pellets.
- ◆ Addition of new seed material, in order to keep the number of pellets constant.

CHEMICAL REACTIONS:

If alkalinity of the raw water is high enough then lime is used as a reagent. The chemical reaction is :



Alternatively, if the alkalinity is too low caustic soda can be used. The chemical reaction is :



Successful Operation:

1) The use of a fluidized bed.

- ◆ Provision of a very large crystallization surface [5,000 - 10,000 m²/m³].
- ◆ Operation - At High Rates,
 - At High Efficiency
 - Prevention of pellet cementing.

2) The use of crystallization instead of Precipitation / Flocculation.

- ◆ Crystallization of metal or anion occurs directly from the water into the crystal lattice.
- ◆ So pure, almost water free salt pellets with moisture content of only 5 - 10%

DISADVANTAGES IN PRECIPITATION / FLOCCULATION:

- ◆ Incorporation of impurities like organic, suspended matter and other ions.
- ◆ Water content, even after dewatering - 40 - 70%
- ◆ High Disposal costs

CRYSTALLIZATION:

- Economically feasible - high fluid velocity
- Application of large circulation ratio for higher concentrated water.

CIRCULATION PRINCIPLE:

1. At the bottom of the reactor the water is mixed with the circulation stream.
2. The concentration of the metal or anion is lowered by the crystallization on the pellets in the reactor.
3. Part of the total anions is lowered by the crystallization on the pellets in the reactor. Part of the total flow is discharged as clarified effluent, which the other part is returned into the reactor.

Advantages:

- ◆ Compact system
- ◆ Excellent effluent quality
- ◆ No salt addition is required and hence no high TDS effluent stream
- ◆ Hardness from water is recovered as 100% water free CaCO₃ pellets which can be sold
- ◆ No sludge generation
- ◆ No expensive dewatering equipment is required
- ◆ Any waste caustic from the process can be used as a reagent in this system
- ◆ No water wastage like backwash, rinsing etc., and hence huge savings
- ◆ Can also be applied for removal of fluorides, silica, sulfates, heavy metals etc.,