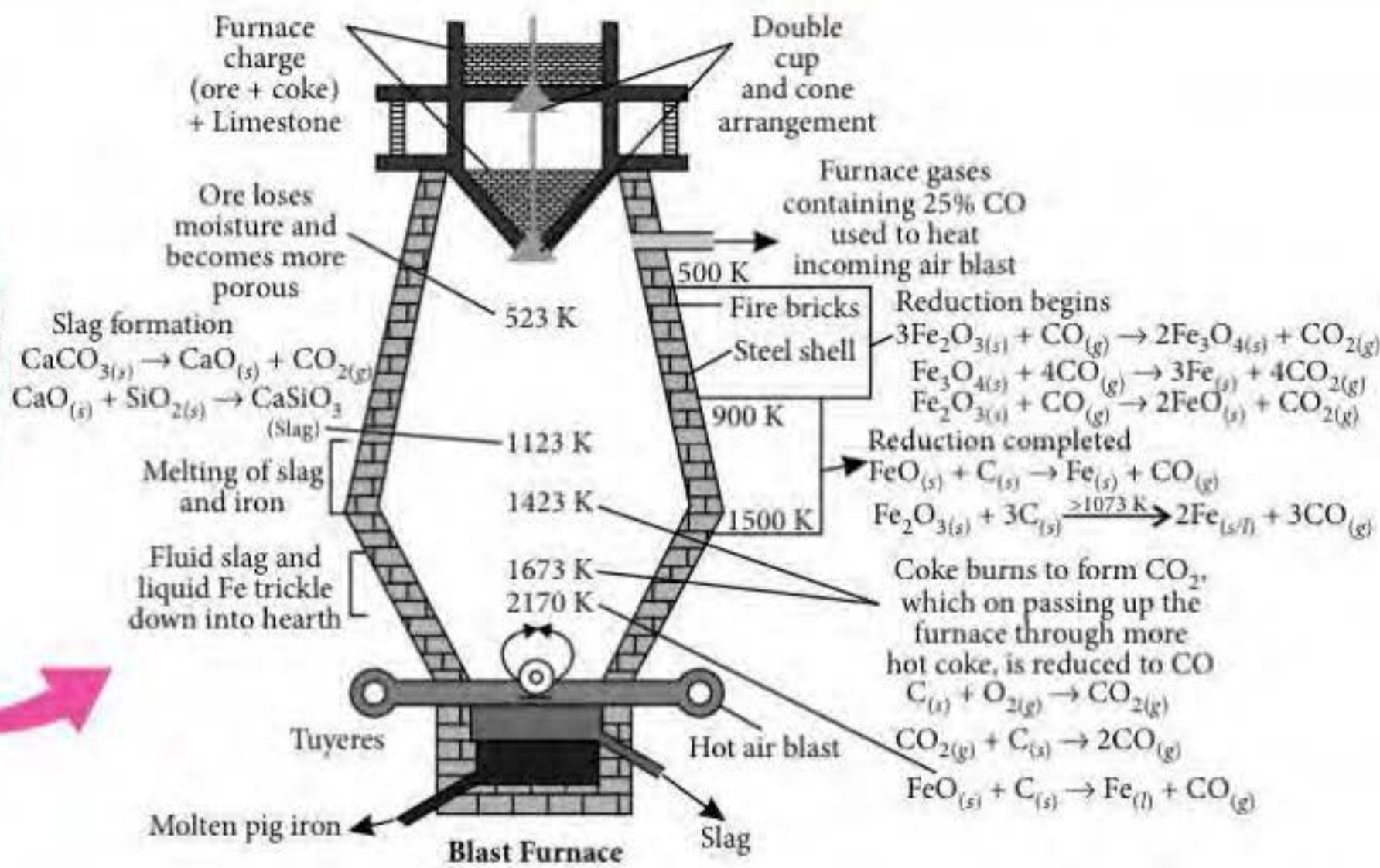


Technological development for extraction of metals from low grade ores is an emerging and important area due to depletion of high grade ore resources. Hydrometallurgy, in principle, can provide viable technical options for processing lean ores.

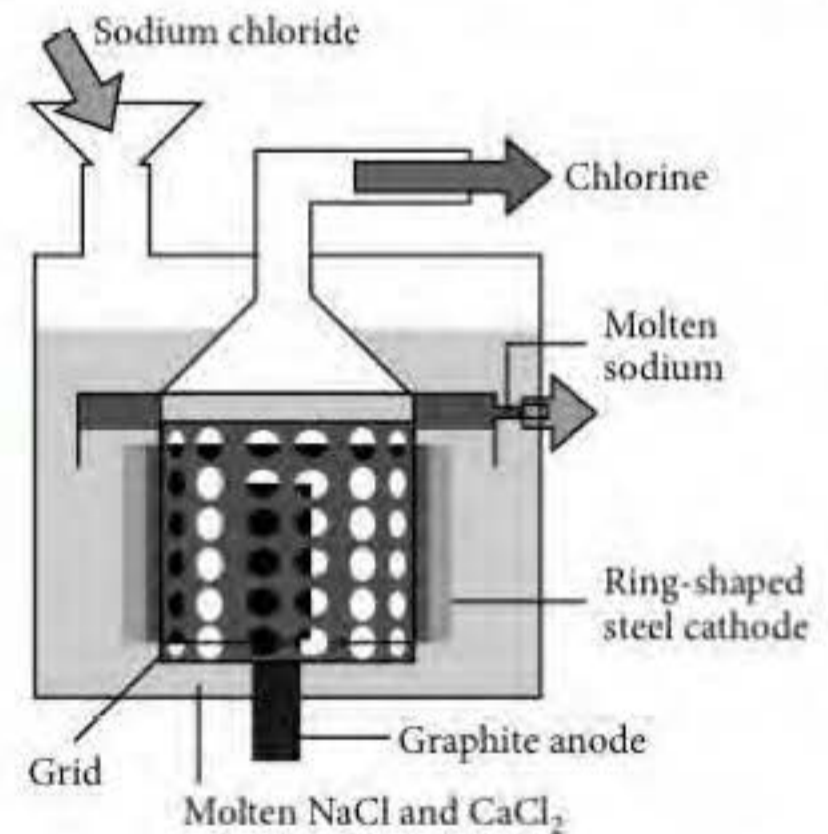
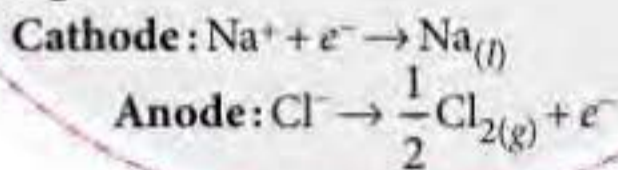
**Iron (Fe)**  
(Pig iron)

- **Concentration**: The crushed ore is concentrated by gravity separation and froth floatation process (for sulphide ores).
- **Calcination**: Ore is heated strongly in the presence of a limited supply of air in a reverberatory furnace. Sulphide ores are roasted to their oxides.
- **Smelting**: Calcined ore is smelted in a blast furnace.



**Sodium (Na)**  
(Down's process)

- The oxides of highly electropositive metals like Na, K, Mg, Al requires very high temperature for reduction.
- These metals are extracted by the electrolysis of their oxides, hydroxides or chlorides in fused state.
- A small amount of some other salt is added to lower the fusion temperature or to increase the conductivity or both.
- Electrolysis of fused mixture of NaCl and CaCl<sub>2</sub>:



**Aluminium (Al)**

(Hall - Heroult process)

- Process of obtaining aluminium by electrolysis of a mixture of purified alumina, cryolite and fluorspar. Purified alumina is obtained by calcination of bauxite ore (Al<sub>2</sub>O<sub>3</sub>·xH<sub>2</sub>O).
- Electrolytic reactions involved:

