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Flotation Chemistry and Mineral Processing

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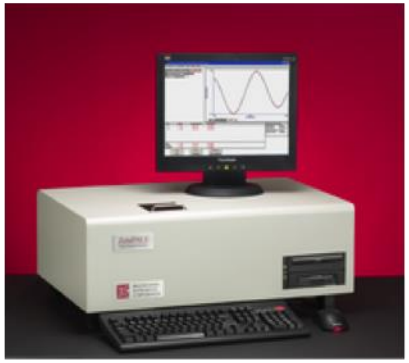
Research Interests

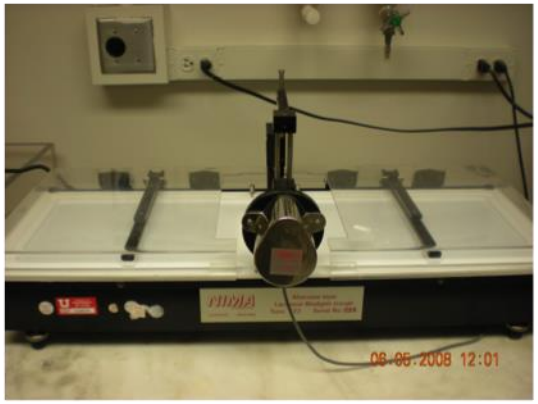
- The research activities involve both fundamental and applied aspects of Mineral processing , and surface & colloid chemistry in the development of flotation technology,
- Flotation Chemistry of sulfide and nonsulfide mineral
- Molecular Dynamics simulation
- Hydrometallurgy
- Waster water treatment and recycling

Surface Chemistry Lab



ZetaPALS Zeta Potential Meter

Surface tension meter



LB film deposition

Contact angle meter

Determination of Flotation Mechanism

- Characterization
- Hydrophobicity
- Electrokinetic Studies
- Adsorption
- Interaction Forces

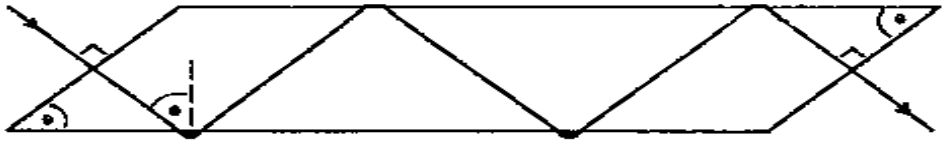
Spectroscopy Lab

Adsorption

- Infrared Spectroscopy
  - Ex-Situ (without aqueous phase)
    - Transmission
    - Diffuse Reflectance
  - In Situ (in presence of aqueous phase)
    - Internal Reflection Spectroscopy

In-situ FTIR/IRS

Real-time Spectra Data



Quantification

- Adsorption Density
- Adsorption Kinetics
- Adsorption Isotherms

Specification

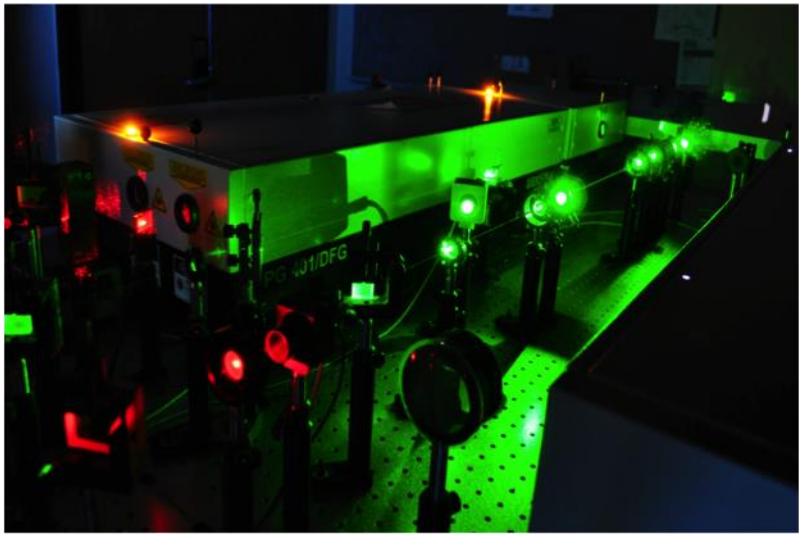
- Chemisorption
- Physiorption
- Precipitation

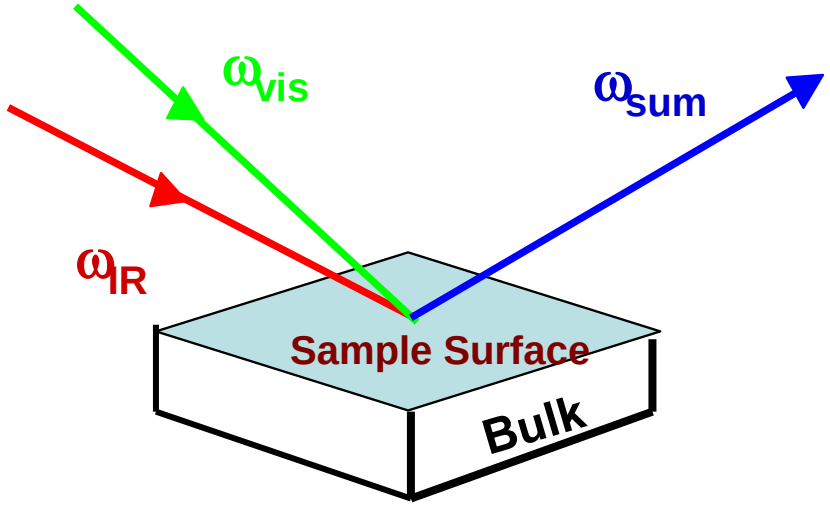
Orientation

- Conformation
- Orientation Angle
- Aggregation State

Spectroscopy Lab

Sum Frequency Generation Vibrational Spectroscopy (SFVS)

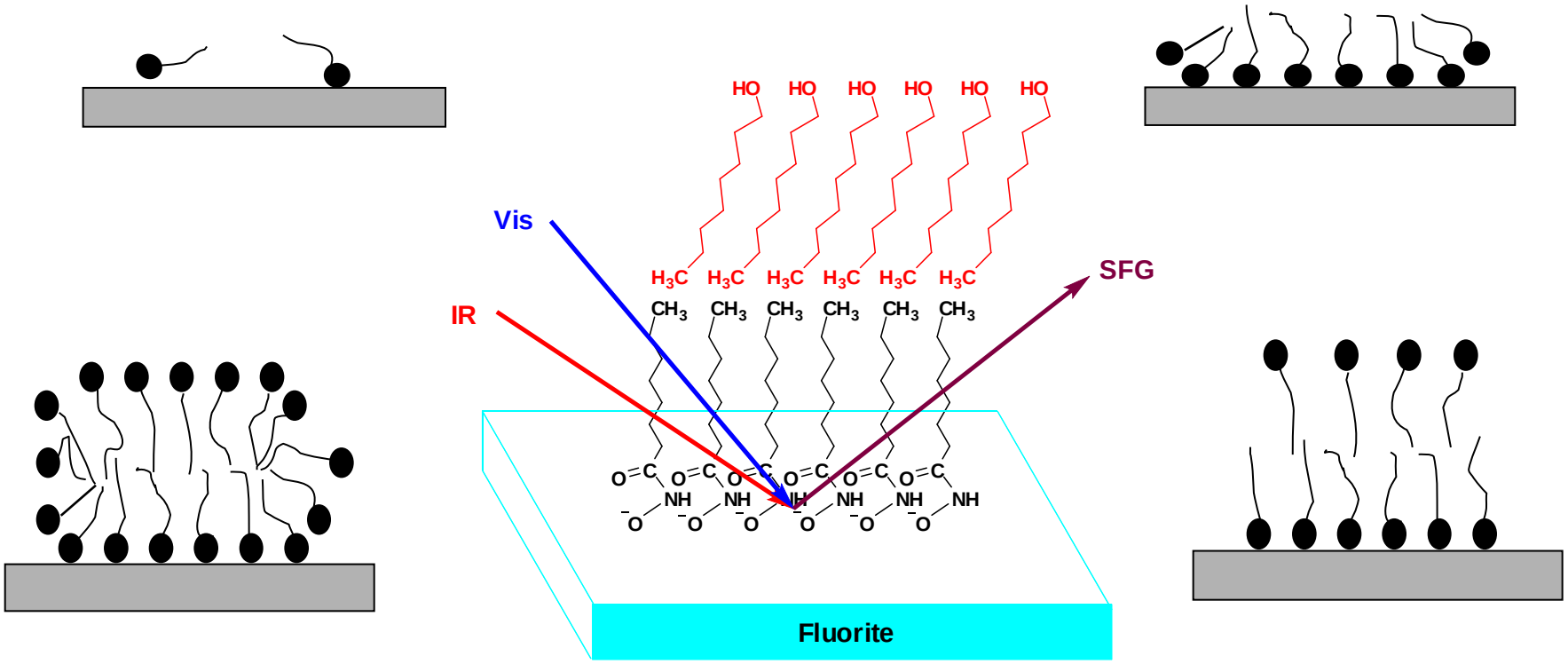




$$\omega_{Sum} = \omega_{IR} + \omega_{VIS}$$

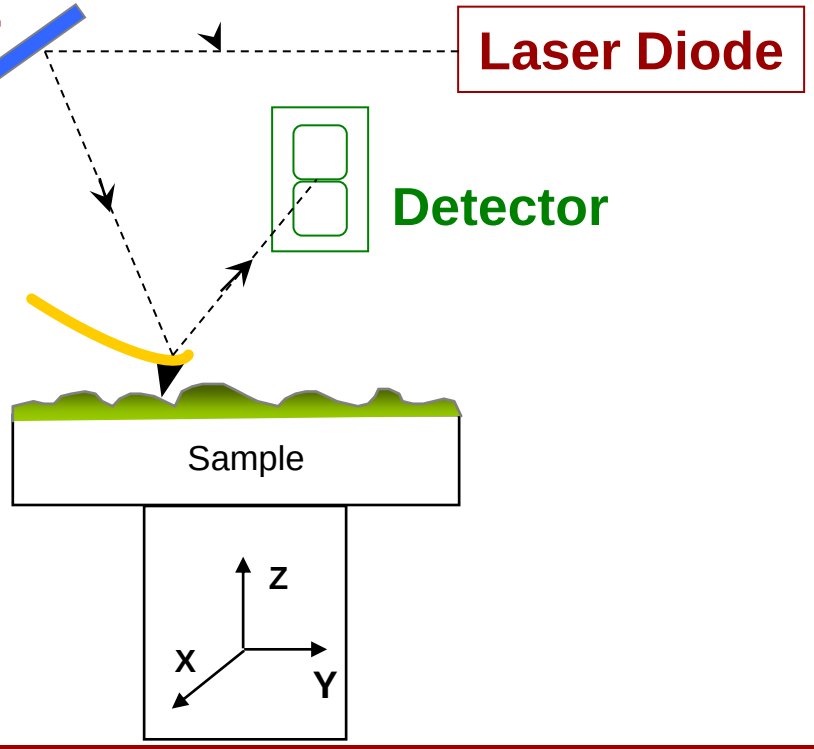
SFVS is a surface-specific technique that provides vibrational spectra of molecules at interfaces. It relies on the non-linear optical phenomenon of sum frequency generation.

SFG is a Powerful tool to Analysis Molecular Adsorption Structure at Interfaces



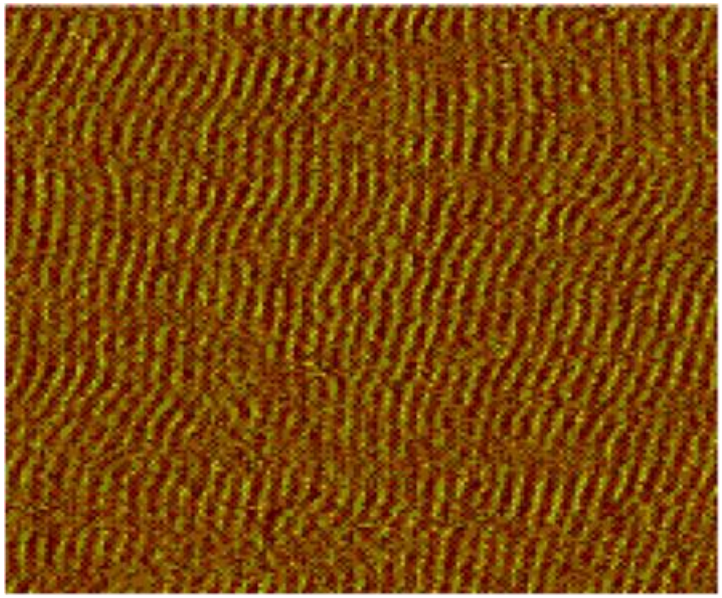
Atomic Force Microscopy (AFM) Lab.

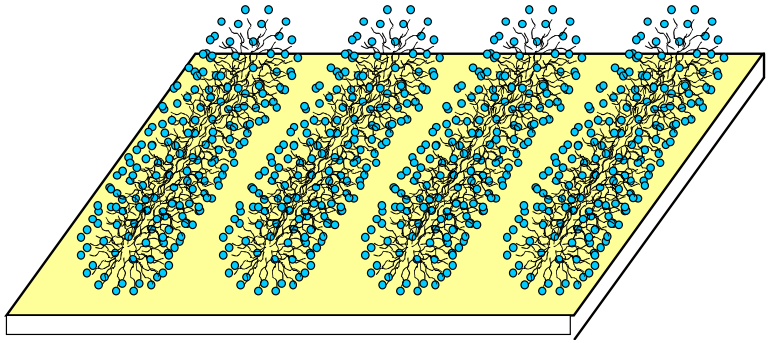
Instrument used to measure properties of Surfaces



AFM Topography Image

Surfactant Head group Effect
Hydrophilic Mica Surface

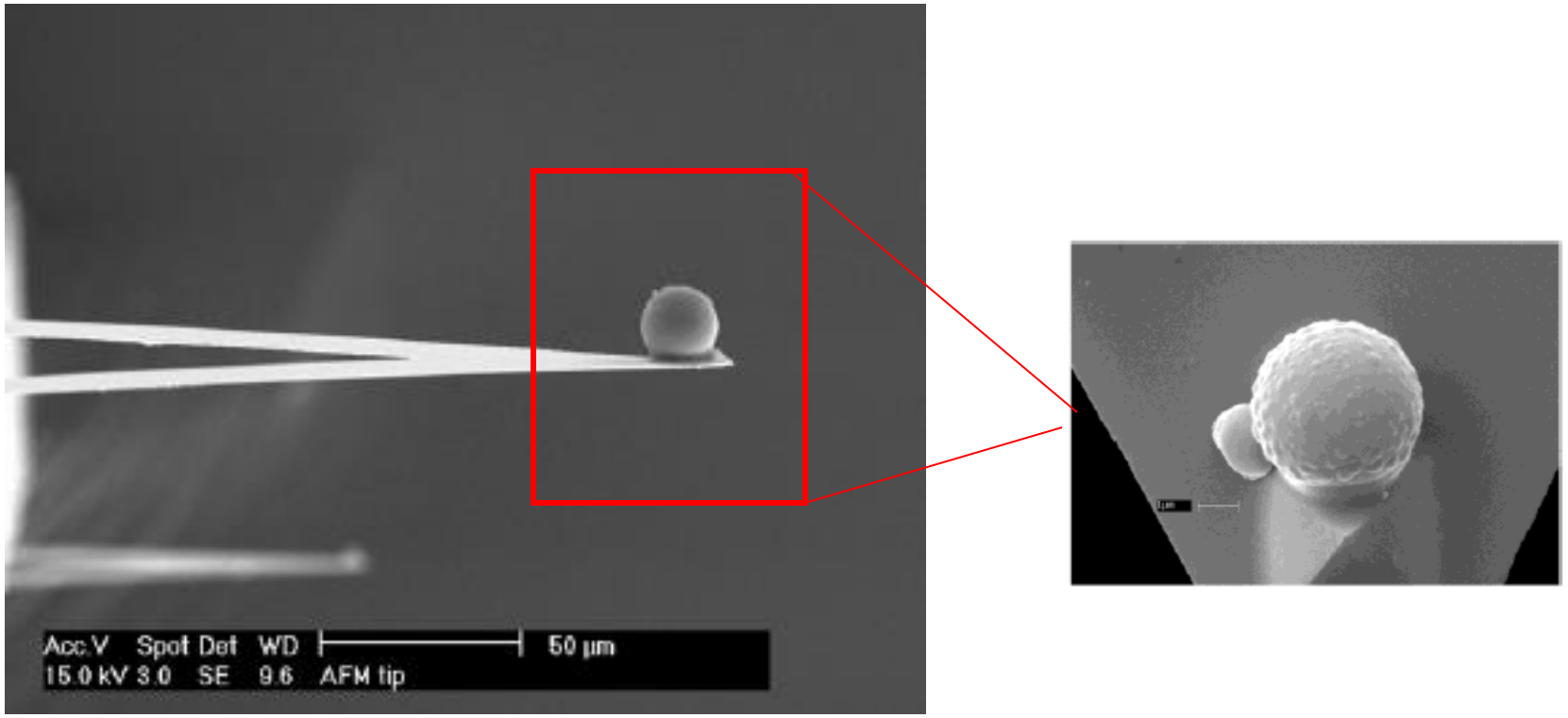




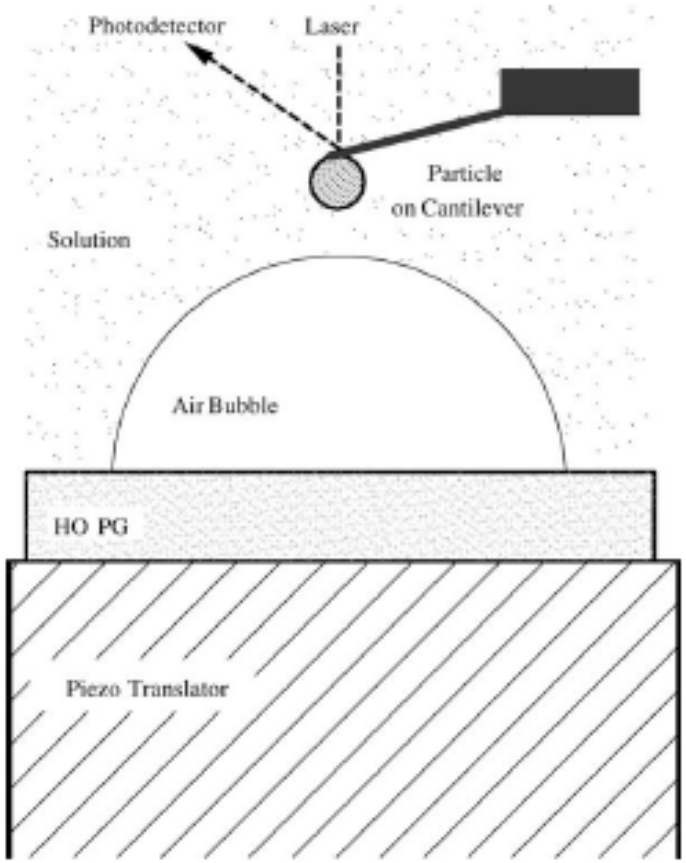
Tertiary amine – dodecyl dimethyl ammonium hydrogen chloride, short cylindrical worm like structures

(200 nm scan)

A Typical Colloid Probe

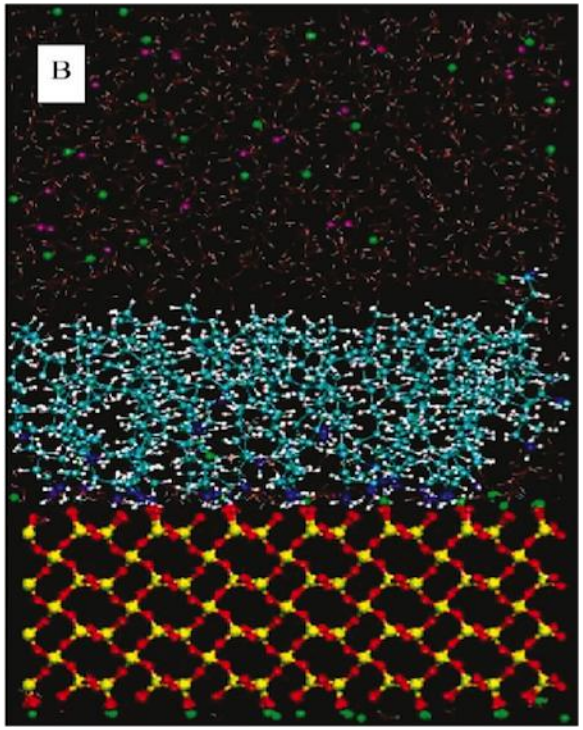


Force measurement between a particle and air Bubble

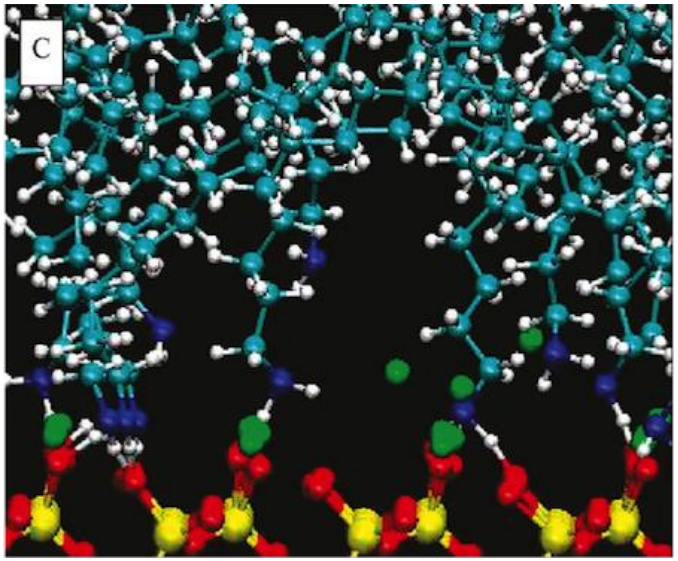


Molecular Dynamics Simulation (MDS)

MD simulation of 40 DDA molecules near a quartz surface at pH 10



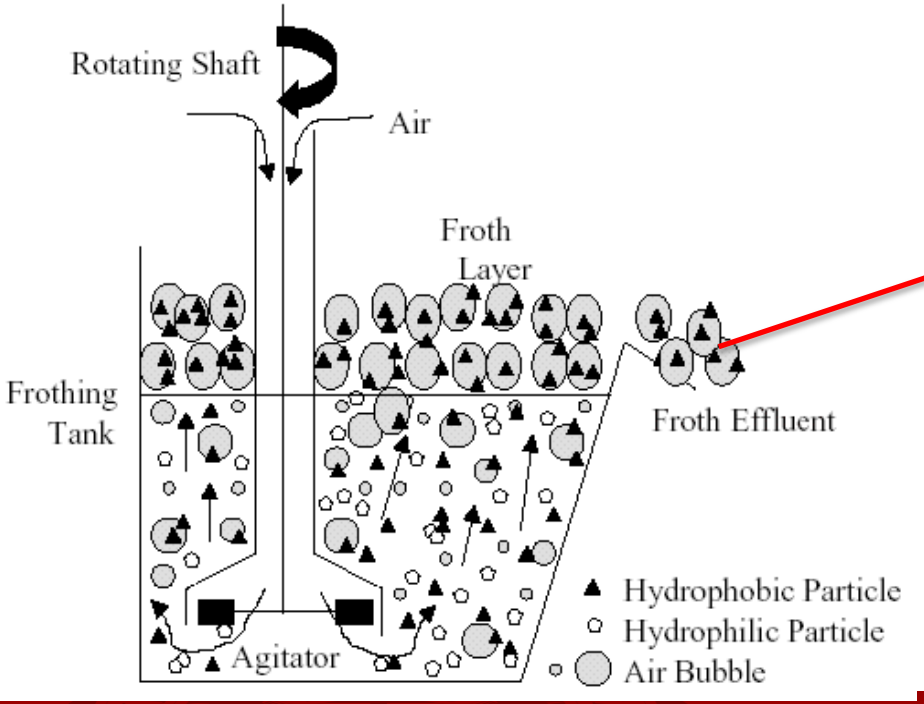
Monolayer formation

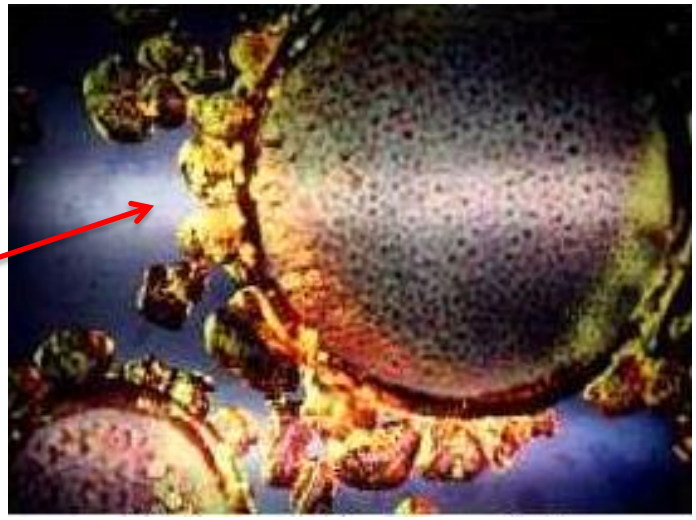


Red: Oxygen
Yellow: Silicon
Blue: Nitrogen
Green: Sodium

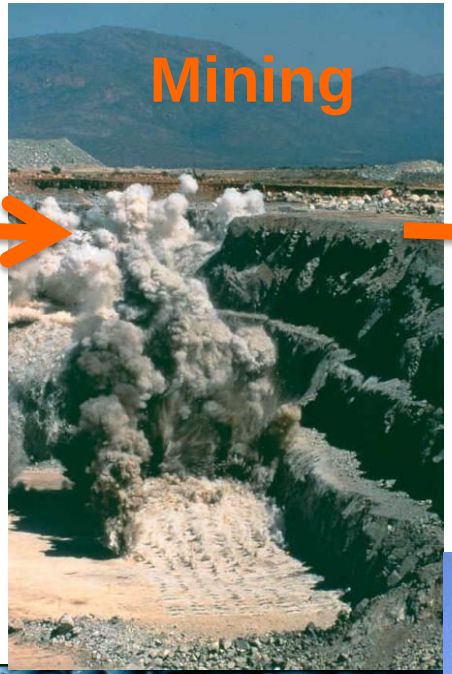
Flotation Principles

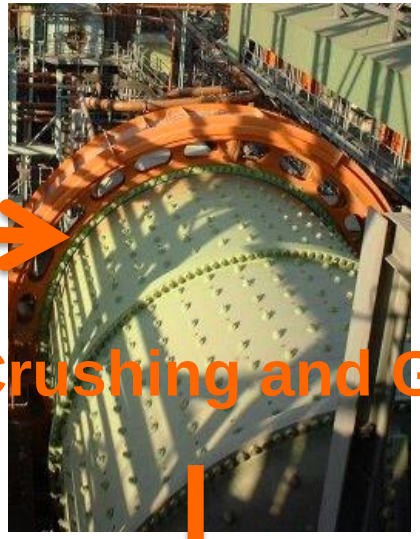
- Air is dispersed in the suspension. Hydrophobic particles attach to air bubbles and are collected in a froth phase while other hydrophilic particles remain in suspension

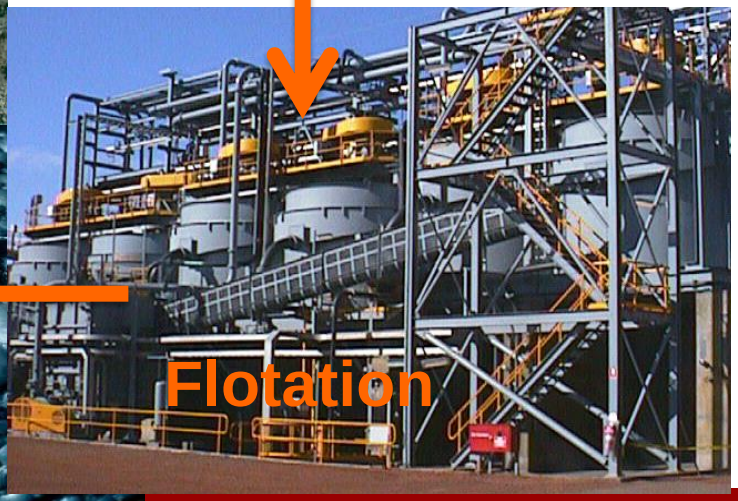




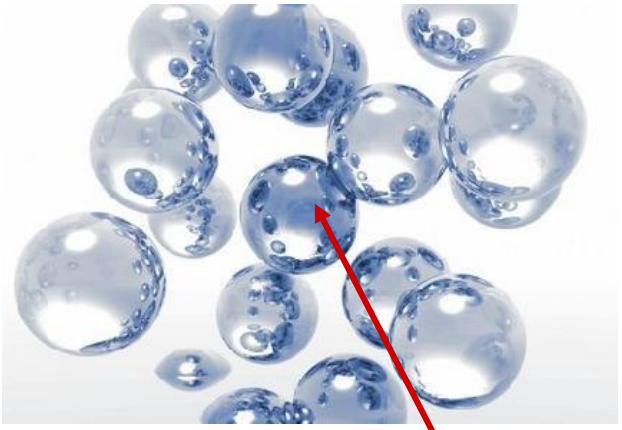
Metal Recovery







Waste Water Treatment

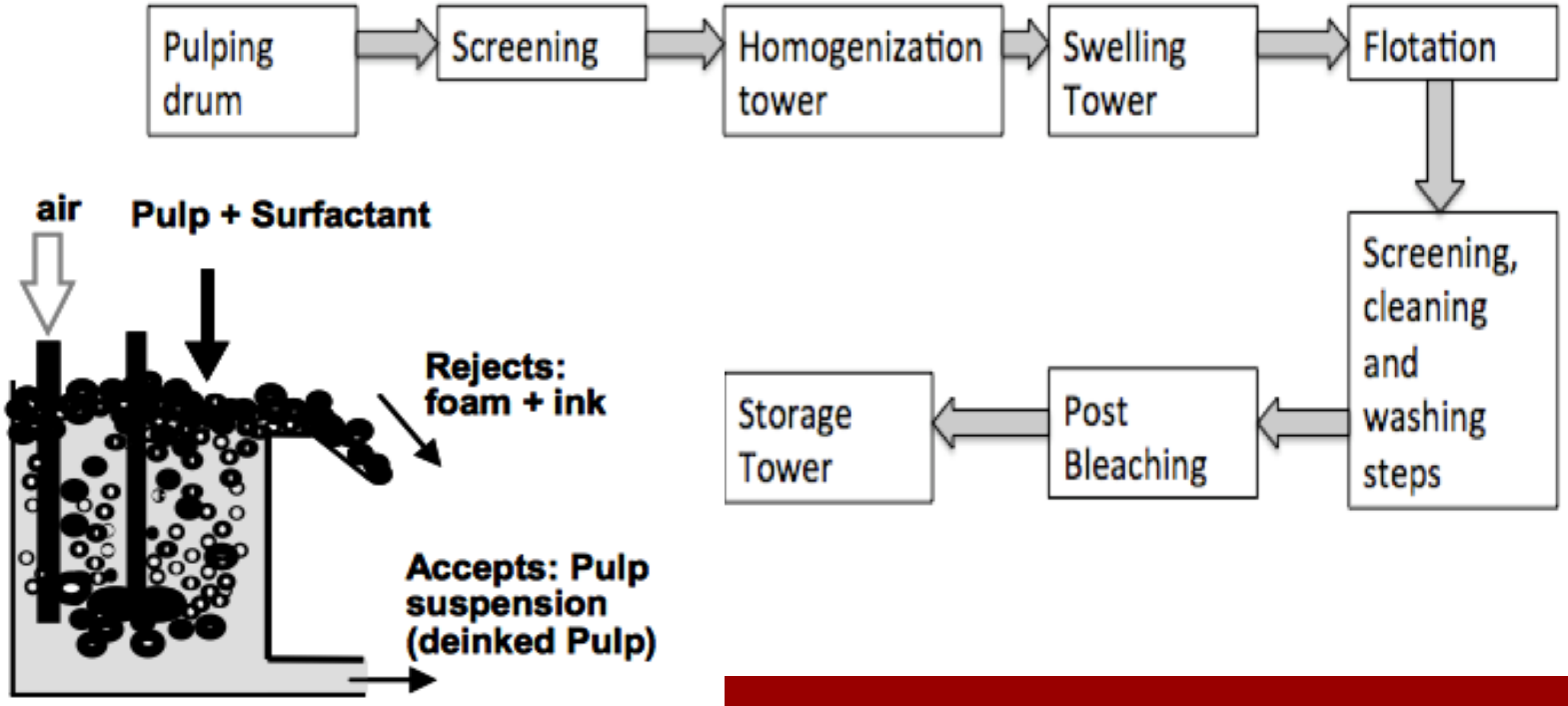


Flocculation and Flotation

Waste Paper Recycling

Deink Flotation

Many types of paper are subject to a deinking step in order to remove ink from the waste paper in preparation for producing new paper Several processes are used, most commonly flotation or washing.



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- 3rd International Conference and Exhibition on Material Science and Engineering 2014, San Antonio, USA

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