Froth Flotation Chemistry Training Course

Professional Development Training Course Outline

Category	General Training	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Froth Flotation Chemistry is a critical mineral processing technique widely used in mining, metallurgy, extractive metallurgy, ore beneficiation, and mineral separation engineering. Froth Flotation Chemistry Training Course is designed to provide a deep understanding of the physicochemical principles, reagent chemistry, surface chemistry, interfacial phenomena, and process optimization strategies that govern selective mineral separation. Participants will explore how hydrophobicity, bubble-particle attachment, zeta potential, adsorption mechanisms, and collector chemistry influence flotation efficiency in modern concentrators. The course integrates theory with industrial applications, ensuring learners understand how to improve recovery rates, grade quality, and operational efficiency in real beneficiation plants.

In today’s data-driven mining industry, froth flotation is increasingly optimized using AI-driven mineral processing, process automation, reagent optimization, and sustainable beneficiation technologies. This course equips participants with practical and theoretical expertise to address challenges such as fine particle recovery, complex ore bodies, slime coating, and reagent selectivity. By the end of the program, learners will be able to design, troubleshoot, and optimize flotation circuits using modern chemical strategies, aligning with global best practices in green mining, ESG compliance, and energy-efficient mineral processing systems.

Programme Curriculum

Froth Flotation Chemistry Training Course

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Course Duration

5 days

Course Objectives

1. Understand froth flotation fundamentals and surface chemistry principles
2. Analyze collector, frother, and depressant reagent chemistry
3. Optimize mineral liberation and particle size distribution
4. Evaluate hydrophobicity and contact angle measurement techniques
5. Apply zeta potential and electrokinetics in mineral separation
6. Improve selective flotation and gangue rejection efficiency
7. Design flotation circuit configurations and flow sheets
8. Enhance ore beneficiation and recovery rate optimization
9. Troubleshoot flotation cell performance and operational issues
10. Implement process control and automation in flotation plants
11. Integrate sustainable and eco-friendly reagent systems
12. Utilize advanced mineralogical analysis for process improvement
13. Apply industrial case-based optimization in real mining operations

Target Audience

1. Mineral processing engineers
2. Metallurgical engineers
3. Mining industry professionals
4. Chemical engineers in extractive metallurgy
5. Plant operators and flotation technicians
6. Geologists involved in ore characterization
7. Process control and automation engineers
8. Research scholars in mineral processing and surface chemistry

Course Modules

Module 1: Fundamentals of Froth Flotation

- Principles of flotation process and mineral separation
- Role of surface chemistry in ore beneficiation
- Bubble-particle interaction theory
- Hydrophobic vs hydrophilic mineral behavior

- Industrial flotation cell overview
- **Case Study:** Copper sulfide ore flotation performance improvement in a Chilean concentrator plant

Module 2: Surface Chemistry & Mineral Interfaces

- Adsorption mechanisms on mineral surfaces
- Role of surface charge and electrostatic forces
- Contact angle and wettability analysis
- Mineral surface oxidation effects
- Interfacial energy concepts
- **Case Study:** Gold ore surface oxidation control in South African mining operations

Module 3: Flotation Reagents Chemistry

- xanthates, dithiophosphates
- MIBC and alcohol-based systems
- lime, cyanide, starch
- Activators and modifiers
- Reagent selectivity optimization
- **Case Study:** Selective flotation of lead-zinc ore using reagent optimization in Australia

Module 4: Mineral Liberation and Grinding Chemistry

- Comminution and liberation theory
- Particle size distribution effects
- Over-grinding and slime formation issues
- Grinding media chemistry
- Liberation analysis techniques
- **Case Study:** Iron ore liberation enhancement in Brazilian processing plant

Module 5: Flotation Circuit Design & Optimization

- Rougher, scavenger, and cleaner stages
- Residence time optimization
- Cell configuration design
- Mass balance in flotation circuits
- Recovery vs grade trade-off
- **Case Study:** Platinum group metals (PGM) circuit optimization in Bushveld Complex

Module 6: Process Control & Automation

- Sensor-based flotation monitoring
- pH, Eh, and reagent dosing control
- AI and machine learning in flotation
- Real-time process optimization
- SCADA systems integration
- **Case Study:** AI-assisted flotation control system in Canadian nickel plant

Module 7: Advanced Flotation Challenges

- Fine particle flotation issues
- Slime coating and entrainment

- Complex polymetallic ores
- Water chemistry effects
- Froth stability problems
- **Case Study:** Rare earth element flotation challenges in Chinese beneficiation plants

Module 8: Sustainable & Green Flotation Chemistry

- Eco-friendly reagent development
- Waste minimization strategies
- Water recycling in flotation plants
- Energy-efficient processing systems
- ESG compliance in mining
- **Case Study:** Sustainable copper flotation circuit redesign in Peru

Training Methodology

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

Ready to enroll or request a customized program? Book online or contact us:

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