

APPLICATION OF CHEMISTRY FOR THE ADVANCEMENT OF FROTH FLOTATION PROCESS: AN OVERVIEW AND VISIONARY APPROACH

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Depletion of high grade resources has necessitated the use of low grade fines, which contain good amount of mineral values and liberate in finer sizes. Froth-flotation, a physico-chemical surface based process, is the most established solution, both technologically and economically compared to other alternatives for fines beneficiation. For successful and effective flotation performance, an understanding of the mineral surface specific adsorption mechanism and proper selection of the reagents regimes along with their molecular chemistry is mandated. This study focuses on the complexity of the flotation process along with adsorption and interaction mechanism of different surfactants in accordance to mineral surface characteristics and their dependency on many micro events. Chemistry lays the foundation and plays a major role in advancement of flotation process. In flotation, many branches of chemistries are involved i.e. study of mineral is related to inorganic and crystal chemistry, interaction between slurry solution and mineral surface is associated with physical chemistry, surfactants used in flotation are related to organic chemistry, structural chemistry, polymer chemistry, electro chemistry and finally product examination are related to analytical chemistry. To further strengthen mineral flotation chemistry, research gears at investigating new surfactants, as it is hard to imagine flotation without chemistry. The selection of reagents with appropriate chemical composition and their administration are of critical importance in view of varied mineralogy, chemical complexity and size consist of feed material. Future investigative research should be towards development of selective and cost effective flotation reagents by insertion of new functional groups, molecular modelling of reagents for more environmental friendly nature, modifying the structure of other chelating agents and novel green chemicals from renewable resources, adding aliphatic alcohol and carboxylic acid to bio-based collectors, adding chaotropic anions to alkyl and aryl surfactants, organic and inorganic salts having strong orientation with more proton donor and acceptor, another cationic group to known surfactants, can be tried for enhanced flotation performance. The study also provides a glimpse on the effect of other parameters like pH, composition of pulp, zeta potential, electrostatic potential etc.

Biography

Abhyarthana Pattanaik currently works as Research Scholar (PhD) in the Department of Fuel and Mineral Engineering, Indian Institute of Technology (ISM) Dhanbad. She currently works on the area of Flotation of iron ore fines and slimes, a potentially commercializable process for fines processing. She has done extensive survey of the process, has put a lot of research efforts so far, attempted new reagent regimes, the fundamentals of reagent-mineral surface interaction chemistry etc. Besides the exhaustive physical, chemical and mineralogical characterization of the iron ore sample, she has carried out flotation experiments (both direct and reverse flotation). She has published five international journal papers in reputed journals and has published more than six papers in international and national conferences and has won two awards for research during her PhD career.

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