PQ Corporation

FloatSil™ Mining Reagent

A silicate based reagent, used as a sulfide and non-sulfide gangue dispersant, depressant and regulating agent in grinding and flotation circuits

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What Is FloatSil™?

FloatSil™ is a silicate based reagent, used as a sulfide and non-sulfide gangue dispersant, depressant, modifier and regulating agent in the grinding and flotation circuits. FloatSil™ is a versatile, environmentally friendly and cost effective selectivity enhancing aid, known to provide valuable metallurgical improvements in processing of a variety of mineral ores. FloatSil™ offers synergistic properties and works effectively with the vast majority of primary mining reagents e.g. collectors, core depressants. It typically contributes to increasing the overall performance result of these reagents in a given mineral flotation circuit. While FloatSil™ is best known as a selective depressant for quartz and silicate minerals in sulfide ore systems, it is also a well recognized depressant for calcite, fluorite and barite minerals in non-metallic systems, and in non-ferrous metallic oxide systems such as chromium, tin and tungsten, rare earths, phosphates just to name a few. FloatSil™ is an established additive for selective dispersion and desliming processes.

How FloatSil™ Works

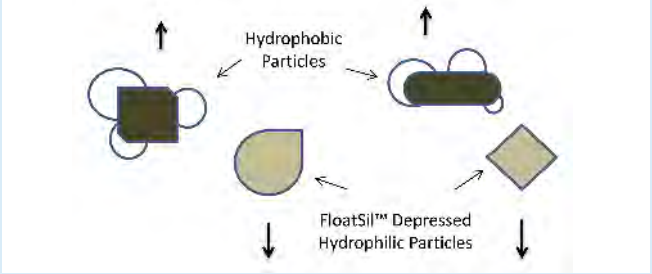
FloatSil™ products contain large concentrations of dissolved alkali and silicate polymers. Hydrolysis of FloatSil™ solutions results in a colloidal dispersion of polymeric, highly charged and very reactive silicate species. Selective adsorption of negatively charges silicate polymers onto minerals alters mineral surface chemistry and modifies particle zeta potential, which is understood as an electro-kinetic force difference in mineral-liquid interface. Surface charge ionization and zeta potential modification results in dispersion. Adsorbed silicate polymers reduce or eliminate activation of surface by hydrolysable metal cations by formation of hydrophilic metal silicate, which results in depression. Active silanol groups in FloatSil™ solutions enhance particle wettability and reduce attachment of hydrophobic collectors.

FloatSil™ Key Functions and Applications

FloatSil™ Depressant:

- Selective adsorption on certain mineral surfaces promotes the hydrophilic nature of silicate polymer
- Depressant for Quartz, floatable silicates, Non-metallic ores: calcite, apatite barite, rare earths, phosphates, potash, talcoueus and clay minerals
- Typical FloatSil™ Dosage: 0.2 – 0.5 Kg of / ton of ore and higher.

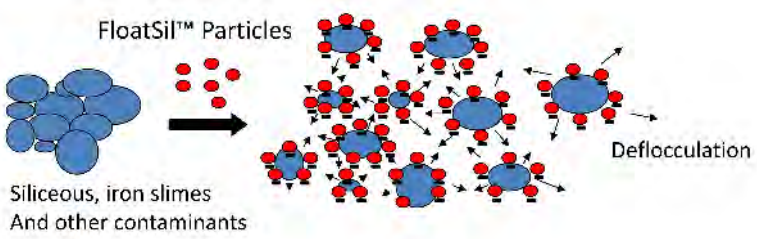
FIGURE 1: FloatSil as a Depressant



FloatSil™ Dispersant:

- Increases the surface charge of various species in the pulp, hence increases mineral repulsions
- Reduces the chemical activity of ions in the liquid phase

FIGURE 2: FloatSil as a Dispersant



- Dispersant for siliceous, iron slimes and other contaminants
- Sulfide ores: Cu, Mo, Pb, Zn,Ni, Au, Ag, PGM
- Iron ores: magnetic / non–magnetic taconites phosphate and potash minerals
- Typical FloatSil™ Dosage: 0.1 – 0.4 Kg/ton of ore

FloatSil™ regulating agent:

- Improves frothing characteristics
- Peptization of the slimes
- Lowers chemical activity of the cations in the liquid phase which may deactivate a given surface

In a mineral flotation, FloatSil™ often performs more than one function; acts as a depressant, dispersant and a regulating agent.

Auxiliary Benefits of FloatSil™

Effect on primary depressants

FloatSil™ demonstrates some synergistic effects when used with primary depressants such as starch, soluble cellulose e.g. CMC and guar gum reagents in depression of highly floatable silicate minerals. The phenomenon is believed to be associated with an increase of the ionic strength and improvement of particle wetting with FloatSil addition. Consequently, a much stronger adsorption of a primary depressant achieved at reduced dosage and improved selectivity of flotation.

Effect on collector reagents

FloatSil™ has the ability to sequester and complex soluble metal cations e.g. Ca+2, Mg+2, Fe+3 in the mineral pulp and liberate the gangue minerals from the ore. The cations react with collector reagents, severely depleting these reagents in a flotation pulp and also compromising the particle floatability. By deactivating cations, FloatSil has the potential to improve flotation selectivity at improved collector reagent consumption.

Advantages of FloatSil™: Grinding and Flotation

Dispersion effects of FloatSil will result in the following benefits:

Grinding Circuit	Flotation Circuit
■ Finer grind and sharper classification	■ Enhanced flotation rates
■ Reduction in grinding slurry viscosity That offers key potential benefits: - Grinding circuit efficiency increase - Grinding mill throughput increase - Lower grinding unit energy requirements - Lower pumping costs - Improved concentrate grades and recoveries	■ Increased selectivity of flotation ■ Increased gangue drainage from froth, by reducing froth viscosity ■ Improved concentrate grades and recoveries

Effect of FloatSil™ on Ni Rougher Flotation Recovery Kinetics

FIGURE 3

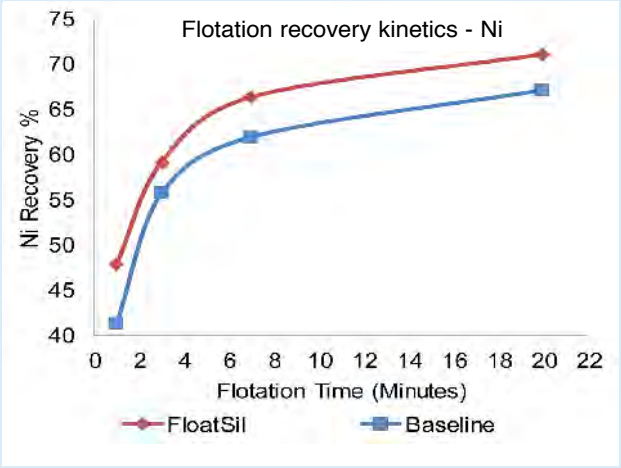
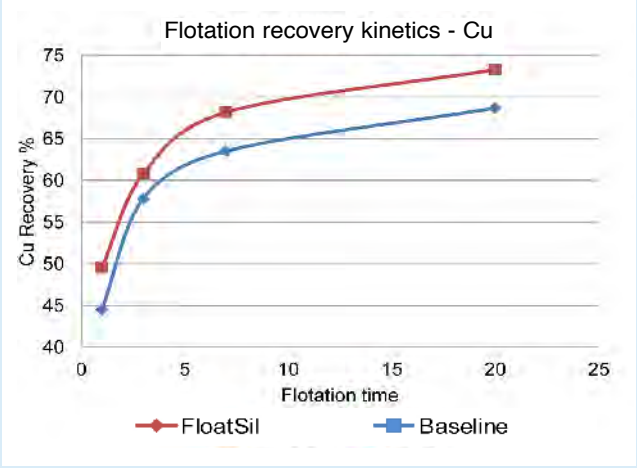


FIGURE 4



Mineral Ores Processed with FloatSil™:

Sulfide Ore Minerals
Precious metals: PGM and Gold
Base Metals: Copper, Zinc, Lead, Nickel, Molybdenum

Oxides of Heavy Metals
Rare earths
Tungsten
Tin

Industrial Minerals
Phosphate and Potash
Iron Ore
Fluorspar
Kaolin clay & silica sand
Garnet

FloatSil™ In A Summary

- Inorganic, non-toxic and environmentally friendly reagent
- A cost-effective grinding and flotation aid in various mineral flotation systems
- Improves the selectivity of flotation, resulting in better concentrate grades and recoveries. This leads to potential significant financial gains and a more profitable operation
- Works well in conjunction with the majority of primary chemical reagents; requires no changes in the existing chemical program
- Can offer secondary benefits such as additional potential savings due to reduced chemical consumption of primary depressants and collector reagents

TECHNICAL SERVICE
PQ Corporation offers a high standard of technical and analytical service to ensure optimum performance of its products. For assistance, contact us via e-mail: techsupport@pqcorp.com

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APRIL 2015 PQ0415

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