Technical Bulletin

LAB 755

Cationic Waste Water Coagulant

Product Description:

THE THEORY OF COAGULATION:
In unstable suspensions, particles first collide due to random Brownian motion or agitation, then are bound together by London or Van der Waals attractive forces and finally settle out from the suspension. This process is called coagulation.
The suspensions of finely divided solids encountered in the mining industry usually form stable suspensions. Electrostatic repulsion between individual particles keeps them apart. Each particle has a net surface charge. Associated with the charged surface is a surrounding double layer "cloud" of oppositely charged counter irons. As the particles attempt to collide, their double layers repel one another such that they cannot coagulate.
Suspensions can be made to coagulate in three ways:

1. Reducing the surface charge;
2. Collapsing the protective double layer; and
3. Polyelectrolyte bridging.

Near neutral pH, most solids in water are negative. Surface charge, however, varies with pH. It may be positive, negative or zero. The charge becomes zero (isoelectric point) at a characteristic pH for each solid. As the pH approaches this isoelectric point, the surface charge and the counter ion double layer diminish. With less repulsion between particles, coagulation then begins.
Added electrolytes, and particularly inorganic Fe++, Al+++ and Ca++ ions, compress the double layer. Like a lower surface charge, a compressed double layer provides less inter particle repulsion and permits coagulation to occur.
Polyelectrolytes are believed to coagulate suspensions by bridging. This theory pictures high molecular weight polymers as first adsorbing on particles, with dangling polymer chains remaining in solution. Subsequent adsorption of this free end on other particles completes the bridging action. When the bridged particles randomly move toward one another, more polyelectrolyte chains attach to each surface. By this action, particles are pulled together and coagulation occurs.
The smaller the particle in suspension, the greater will be its charge density and the stronger it will repel the anionic polymer. This is the reason for the light haze usually left in water treated only with an anionic coagulant. In many cases, pre-treatment of the suspension with a cationic polymer will lower the charge density on the particles and initiate coagulation. Subsequent treatment with an anionic polymer results in rapid settling and very clear water.
With increasing emphasis on water quality throughout the mining industry, sophisticated water treatment systems utilising combinations of coagulants are becoming commonplace.
LAB 755 is a liquid cationic coagulant, effective as a primary coagulating agent in water clarification, thickening and filtration. LAB 755 is particularly efficient for the treatment of coal plant effluents and iron ore.

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Application:

LAB 755 is a highly effective, cationic coagulant. It may be used as a primary coagulant, as a coagulant aid, or as a dewatering aid either alone, in combination with inorganic coagulants, or with nonionic or anionic polyelectrolytes. It is useful in the treatment of coal plant effluents, iron ore slimes, chemical precipitates, clays, bentonites, blast furnace dusts, slag fines, residues from acidic ore digestions, raw industrial waters, organic wastes and sewage.

Typical mine water sample prior to addition of Castle Lab 755

Typical Mine water sample following treatment by addition of Castle Lab 755

LAB 755 coagulant should be metered to the system continuously by use of a corrosion resistant, positive displacement pump and diluted 5:1 to 50:1 with clean water prior to being fed to the process stream. Essential for maximum efficiency is the immediate and thorough mixing of the coagulants with the substrate.

The coagulant feed solution should be fed to the pulp as close as possible to the area where actual separation takes place, but not so close that efficient floc forming is prevented because of too short contact time. Contact time has to be determined by experiment for the coagulant to perform advantageously.

TREATMENT LEVELS:

As coagulants for clarifying surface mine runoff water:

Between 0.0002% to 0.005% depending on nature of fines / problem.

TYPICAL PROPERTIES:

APPEARANCE	Clear to slightly hazy liquid
SPECIFIC GRAVITY at 25°C	1.10 - 1.20
pH	2.0 - 3.0
SOLUBILITY IN WATER	Infinite
EFFECTIVE CHEMICAL CHARGE	Cationic
SHELF LIFE (10° to 38°C)	12 months

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