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Calcium Chloride *Market Reviews*

Industrial Uses

4 Chemicals

Calcium chloride is used in the production of metals, electronics, paper, calcium salts, gypsum and other products. Depending on the application, it serves as an inexpensive source of calcium ions, a flux, an aridizing agent or another purpose.

DESCRIPTION

Calcium chloride is used to make sodium chlorate, calcium alloys, metallic sodium and magnesium, phosphors, gypsum and many calcium compounds.

Sodium chlorate production

Sodium chlmorate, a strong oxidizer used mainly as a feedstock for chlorine dioxide at paper mills, is made by the electrolysis of purified sodium chloride (NaCl) using active titanium anodes and steel cathodes. Electrolysis decomposes NaCl and water to sodium chlorate and hydrogen. The reactions involved are slow, so the electrolyte is circulated away from the cell. Sodium chlorate is removed by cooling the cell effluent and recovering it in a vacuum crystallizer. The remaining weak NaCl electrolyte returns to the cells after new NaCl is added.

Calcium chloride comes into play in these systems by controlling sulfates in the raw-salt and weak-recycled brines. When sulfates are too high, they coat the titanium anodes and reduce electrical efficiency. Even a small loss in efficiency can be costly given the amount of electricity needed. Also, sodium sulfate can crystallize between electrode packs at concentrations above 25 g/l, creating a hazard.

Removal of sulfates with $CaCl_2$ involves precipitation, decantation and filtration. Systems that do not pretreat for sulfates in this way must be flushed with a barium bath every three to four months. Calcium chloride extends treatment intervals to about four years.

Removal of sulfates with $CaCl_2$ as a precipitant has many advantages. It lowers capital cost versus refrigeration systems and helps provide high-purity sodium chlorate for chlorine dioxide generators, which is needed to satisfy environmental standards. It also controls costs by allowing use of a lower grade of NaCl, and it involves a relatively simple technology that is especially economical for low-to-medium-volume systems. Calcium chloride precipitates sulfates by the reaction:

$Na_2SO_4 + CaCl_2 > 2NaCl + CaSO_4$(prec.)

This reaction usually occurs in the settling tank of the brine (electrolyte) purification system, where insoluble calcium sulfate precipitates and purified NaCl electrolyte is decanted. $CaCl_2$ is added in excess to increase the likelihood of chemical reaction. The weak electrolyte is often passed through an ion exchange unit to replace calcium ions with sodium ions. Calcium ions can also be removed with soda ash.

Calcium alloy production

Calcium chloride is both a flux and a raw material in the production of alloys of calcium and other metals, including aluminum, lithium, magnesium and beryllium.

Sodium and magnesium production

Electrolysis of molten baths containing $CaCl_2$ and sodium or magnesium chloride forms metallic sodium and magnesium. Calcium chloride acts as a flux, lowering the melting point of the salt bath and substantially decreasing the energy needed to keep the baths in their molten state.

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Phosphor production

Calcium chloride is a raw material for the high-purity calcium carbonate used to produce phosphors coated on the inside of fluorescent bulbs, TV screens, video games and others products. High purity is essential because these phosphors must be low in metal ions to enhance image brightness.

Gypsum production

Calcium chloride is an aridizing agent in the manufacture of gypsum, i.e., it lowers the water required to make a paste. The reduction in water demand allows such gypsum products as plaster of paris and wall plaster to have higher densities and strengths.

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