INDION

Metal Removal – Sulfex Process

Introduction

Hydroxide precipitation, which is conventional process for removal of heavy metals from wastewater has two drawbacks:

- Some metal hydroxides tend to re-dissolve upon increasing the pH value above a certain critical value. This is called "amphoterism". In case of a mixture of heavy metals, an operating pH ideally suited for efficient removal of one metal is unfavorable for the good removal of the other.
- In the presence of chelating agents such as EDTA, metal hydroxide precipitation is incomplete.

With ever increasing stringent limits for effluent disposal, hydroxide precipitation cannot meet the required permissible limits.

The development of Sulfex process eliminates both the above deficiencies and has been in commercial use for several years. This precipitation technique involves an exchange of sulphide ion between ferrous sulphide and the heavy metal ion present in the effluent as pollutant.

Sulfex Process Principle

In order to precipitate any of the heavy metals as sulphides, the sulphide source added to the solution of the metal must be more soluble than the metal sulphide to be precipitated. As the added sulphide dissolves, the dissociated sulphide ion then reacts readily with the heavy metal that has lower sulphide solubility. When equilibrium is reached, the metal of lower solubility will be precipitated and the one of higher solubility will remain dissolved.

In the Sulfex process FeS is used as the sulphide source. Starting with a soluble sulphide, such as Sodium Hydrogen Sulphide, (NaHS), this is reacted with an equivalent or excess amount of ferrous ion (Fe ++) so that there can be no excess sulphide relative to the ferrous ion. Therefore, the only ionic sulphide that will be present is due to the solubility of FeS.

Features

- Since FeS is rather insoluble, only 3 x 10-2 ppb of free sulphide is present in a natural aqueous solution. This concentration is too low to produce an odour of Hydrogen Sulphide, but it is high enough to react with the Heavy metals that are less soluble when combined with sulphide.
- Fe 2+ + S 2- + M 2+ + S04 2- + Ca (OH)2 = MS + Fe(OH)2 + SO4 2- + Ca 2+ (Where symbols have usual meaning)
- The pH of the water is maintained in the range of 8.5 to 9.0 causing the iron to precipitate as ferrous hydroxide. Iron is relatively insoluble under these conditions, normally less than 0.5 mg/lit, such concentration of iron are considered nontoxic and acceptable in an ecological system.
- The addition of lime (or caustic) to elevate the pH and precipitate the excess iron also improves the removal of heavy metal sulphides because they too are less soluble at the higher pH values.
- The main advantage of the Sulfex process is its ability to remove hexavalent chromium in one step as opposed to the typical two-step process used with hydroxide precipitation. Possible reaction is as follows:
  Cr04 2- + 4H20 + FeS = S + Fe(OH) 3 + Cr(OH)3 + 20H- Here Chromium is removed as hydroxide precipitate.

Applications

- Metal processing industry
- Metal refining
- Automobile industry

Ion Exchange LLC
46722, Fremont Blvd., Fremont, CA – 94538, USA.
Phone: 408 649 5639 Fax: 408 649 5658 Email: info@ionexchangeglobal.com
Website: www.ionexchangeglobal.com