CODE 68B PROJECT

copper arsenate

Giant Yellowknife Mines Limited

Falconbridge Limited

The Applied Research Group, Inc.

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MAJOR PROCESS STEPS

IN THE PRODUCTION OF COPPER ARSENATE

1. The recovery of a high-solids residue after arsenic extraction.

Our top chemical people have more than twenty-five years experience in the production of inorganic chemicals. One of the major problems that they have worked with and repeatly solved is filtration.

A good example that illustrates their past success in solving a related problem is their success in taking zinc carbonate which normally precipitates as an almost blinding voluminous precipitate containing over two-thirds water when filtered at atmospheric pressure to a crystalline product that drained and filtered so well that production on a belt filter was possible. The research goal was to develop a filterable form so dry that the product could be packaged in paper containers without the investment and costs of operating a dryer.

The project was successfully accomplished. The resulting plant has produced truckload quantaties shipped in paper bags and boxes for almost ten years.

Some of our experience in this field:

Zinc chemical production.
Magnesium chemical production.
Manganese chemical production.
Copper chemical production.
Arsenic chemical production.
Germanium chemical production.
Aluminum chemical production.
Antimony chemical production.
We are some of the most experienced people in the use of aqueous ammonia as a solvent for chemical production.
Pigment production.
Use of Giant arsenic trioxide in arsenic acid production without a refinery.
Magnetic iron oxide research.

2. Economic (time & money) dissolution of copper into the ammonia-arsenic trioxide solution.

We have initiated and commercialized three industrial scale copper-ammonia projects. They are: the production of copper ammonium carbonate; the production of copper carbonate; and the development and production of a non-carbonate copper ammonium complex which has become a successful argicultural fungicide.

The total metallic copper that we have dissolved and converted into these copper chemicals is in excess of 10,000 tons as metallic copper.

3. Economic (time & money) oxidation of arsenic to the pentavalent state.

We started studying the oxidation of arsenic trioxide in ammonia solutions about twelve years ago. We have used both air and oxygen. Initial results were negative. During the last two years, we have invented a process that allows either air or oxygen oxidation and have fully identified the "window" through which this oxidation occurs. The procedure is both quantative and rapid.

Our initial process required both alkali and pressure. Our present process requires neither.

4. Economic (time & money) stripping of ammonia to precipitate copper arsenate.

Most of the 10,000 tons of copper that we have reacted in ammonia solutions was reprecipitated as copper carbonate for use in CCA manufacturing and for other copper chemicals. After studying precipitation processes used in the mining industry, we developed new stripping methods that minimized copper oxide formation and maximized ammonia recovery. We also developed a crystal structure that facilitated recovery.

We also developed several procedures that economically recovered and utilized small quantaties of ammonia that were otherwise not economic to capture.

Our experience with ammonia processes goes back twenty years. The first ammonia based research we did was on a new method of seperating zinc, copper, and arsenic values from precipitates that resulted from the purfication steps used in electrolytic zinc refining at American Zinc's (now AMAX's) East St. Louis refinery.

5. Recovery of the copper arsenate precipitate from the resulting mother liquor.

At present we believe that we can develop a very filterable copper arsenate precipitate that, hopefully, will require little or no drying.

This will be similiar to the work that was previously done in developing a similiar zinc carbonate.

6. Demonstrate the use of copper arsenate as a superior raw material for CCA production.

We have been working in the laboratory with copper arsenate for more than two years. Some drum lots have been produced and used in CCA manufacturing. We are confident that a copper arsenate can be produced from this process that can be used to manufacture CCA that is equivalent to the best CCA on the market today. It is possible that a copper arsenate can be produced that will make a superior CCA to any of those presently manufactured.

PILOT PLANT

Our proposal is that the process be piloted in three stages:

I. Investment can be held to a minimum by utilizing a spare reactor presently available at Applied Research. By using refined arsenic trioxide, chipped cathode copper, and performing all steps in one vessel, we not only almost eliminate capital at risk, but we can also startup in sixty days or less.

This Stage I pilot plant will be able to check every process parameter except recovery of insolubles from Giant trioxide.

II. This will be the addition of equipment to the Stage I plant to allow 100 % operation with Giant arsenic trioxide.

This will require the addition of dissilving and solids seperation facilities.

III. This will be the stage where the plant's output is used to sample and sell trial lots into the market.

At this stage we should have announced our joint venture and have completed all arrangements for setting the plant.