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PRODUCTION OF SODIUM CYANIDE

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This invention relates to the production of sodium cyanide and more particularly to the production of such product in a substantially pure state by the direct neutralization of caustic soda with impure hydrogen cyanide gas.

Sodium cyanide has heretofore been produced by this general procedure and the sodium cyanide powder obtained by subjecting the reaction product to a relatively expensive purification treatment and to evaporization under vacuum, is still ordinarily in a more or less impure state. The inability to obtain a pure product directly in the conventional prior process is due in part to the fact that towards the end of the neutralization process polymerization and partial decomposition takes place. This unavoidable decomposition not only degrades the quality of the final product but it also causes a loss of hydrogen cyanide values to the process. The decomposition and resultant darkening of the product may be avoided by permitting a substantial amount of the caustic soda to remain in the reaction solution but when this expedient is employed the sodium cyanide content of the final product amounts to only about 90%.

An object of the present invention is to produce sodium cyanide in a substantially pure, undarkened condition from caustic soda and hydrogen cyanide by a simple, inexpensive, practical procedure.

A source of hydrogen cyanide gas available for the production of sodium cyanide is produced by the catalytic reaction of hydrocarbons, air and nitrogen-containing compounds, suitable processes, for example, being described in the United States Patents No. 1,934,838, No. 1,957,749 and No. 2,105,831. However, when such hydrogen cyanide gases are employed for the production of sodium cyanide from caustic soda by conventional operations, the product is of low quality due to contamination. It has now been determined that the contamination is due in part to the formation of sodium carbonate through the reaction of sodium hydroxide with carbon dioxide contained in the hydrogen cyanide reactor gases.

According to prior practice the contaminated sodium cyanide solutions have been purified by adding to the solution a quantity of alcohol to precipitate out the sodium cyanide, the crystals formed thereafter being dried under vacuum.

This operation involves unnecessarily high costs due to the expensive operations required including those for the recovery of the alcohol from the caustic solution, the reuse of the alcohol being necessary for economic reasons. The inevitable loss of some of the alcohol also adds to the cost of the operation.

Another object of the invention is to produce sodium cyanide in a reaction of a character which will permit the preparation of the sodium cyanide in substantially pure form without the use of any expensive reagent or process step.

Broadly considered, the process of the invention involves reacting caustic soda with hydrogen cyanide gases containing carbon dioxide as an impurity under procedures which prevent the formation of any appreciable amount of sodium carbonate during the reaction. Through this procedure the decomposition or the polymerization of the hydrogen cyanide with its darkening effect and the loss of cyanide values can be substantially eliminated, and at the same time, a product of high purity obtained.

Specifically, the prevention of the formation of the sodium carbonate is accomplished in accordance with the present invention by suspending an oxygen compound of calcium in the caustic soda solution to be used and, under certain conditions hereinafter described, also conducting the neutralization under controlled temperature conditions. Either lime or calcium hydroxide may be suspended in the caustic soda, the former being preferred. When either of the said calcium compounds are employed under the conditions herein described, it reacts with the carbon dioxide in the gases treated and forms calcium carbonate. This insoluble compound together with any unreacted lime or calcium hydroxide are thereafter separated from the sodium cyanide solution by any suitable means as by simple filtration. If it is desired that the sodium cyanide be prepared in powder form, the solution may be subjected to evaporation under reduced pressure.

To prevent any contamination with sodium carbonate the amount of the calcium compound employed must be at least chemically equivalent to the quantity of carbon dioxide present in the hydrogen cyanide reactor gases treated. Superior results are obtained when the calcium compound is used in substantial excess, best results ordi-