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PROCESS FOR MANUFACTURING ANHYDROUS ALUMINUM CHLORIDE

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The primary object of the present invention is to improve and simplify the production of anhydrous aluminum chloride so as to reduce the cost of the process of manufacture of this chemical. A further purpose of the invention is to produce this chloride with staple materials which can be readily obtained in the market at relatively low initial cost or which lend themselves readily to recoveries which will offset their costs. It is in general the objective to make anhydrous aluminum chloride available industrially in a number of important fields where the same could be employed, or employed more extensively, if the same were available at a price materially lower than the market prices current at present.

The recent discoveries of its value in a number of industrial processes has made it highly desirable to find a method involving cheap materials and inexpensive, convenient methods of production. Much work has been done by chemists to attain this end, but up to the present time no completely successful methods have been disclosed.

Aluminum chloride it appears, was first produced by Oersted, by passing a current of dry chlorine gas over a heated mixture of carbon and alumina. This method was also later used and improved by others. A summary of the known methods of production has been published by Ralston as follows: dry chlorine or dry hydrochloric acid gas acting on aluminum metal, or on aluminum carbide; chlorine gas acting on mixtures of aluminiferous and carbonaceous materials; chlorine gas acting on aluminum nitride; chlorine gas and carbon disulphide vapor on aluminiferous materials; chlorine compounds of carbon or of sulphur on aluminiferous materials; dry lead chloride reacting with aluminum metal or with aluminum carbide; and anhydrous calcium chloride with aluminiferous materials.

The current and known methods of producing anhydrous aluminum chloride above set forth, are relatively troublesome and expensive, especially those in which chlorine gas is used. Nor has any decided advantage resulted from those relying upon reactions between various chlorides and the various aluminiferous materials which have been hitherto employed for industrial production. Chlorides of calcium or of sodium, if directly available, would of course furnish the cheapest and most convenient source of the chlorine for the purpose, but no satisfactory process of employing them in this connection has been found hitherto.

My invention involves the use of aluminum sulphate, preferably in anhydrous form, or under conditions whereunder it will be readily made anhydrous, and causing the same to react with certain suitable chlorides. While aluminum sulphate is not as cheap as the aluminiferous materials which have been employed in other processes, it offers compensating advantages as to the other factors of production, so that the net result as to cost and simplicity is decidedly advantageous.

In view of the industrial and economic limitations, it is necessary to confine ourselves to such materials as are conveniently available in large quantities and at a suitable price, and will readily react directly with each other without undue elaboration of process and/or plant.

Ordinarily it would readily suggest itself to resort to a reaction between some chloride and a salt of aluminum. But the special physical properties of the available chlorides and aluminum salts do not readily lend themselves to such a reaction, because of the requirement to produce an anhydrous salt. The ordinary methods of bringing the reagents together in solution is therefore out of the question, and yet the reaction will not proceed if the aluminum salt and the chloride are merely brought together in the solid form.

The process for producing the anhydrous chloride which is the subject of this invention is to bring the chloride into sufficiently intimate contact with the aluminum salt to permit the reaction to proceed by resorting to fusion of the chloride or a mixture of chloride, as will further appear.

It occurred to me that aluminum sulphate might well serve as the aluminiferous mate-