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METHOD OF PRODUCING AN INSECTICIDE

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This invention relates to free-flowing salts and to methods of making the same. More particularly the invention is directed to the production of free-flowing insecticides utilized in the dry powdered form and applied by dusting.

Insecticidal substances, such as sodium fluoride, have been heretofore employed to a considerable extent in relatively finely divided condition. Generally speaking, prior commercial products of this nature have been such that the dry powder tends to ball up or pack and is not free-flowing. Hence such products may not be satisfactorily distributed by dusting from sifter cans and dust guns. Poisonous salts, such as sodium fluoride, sodium silico fluoride, etc. are more or less widely used as insecticides or insect powders for household purposes in which instances such substances are likely to get into the hands of individuals unaware of the toxic properties of the insecticides. These products are usually sold in the form of white powders which cannot be readily identified merely by appearance, and accordingly have been mistaken at times for flour, baking powder, etc. with disastrous results. For the purpose of identifying poisonous substances utilized as insecticides it has been heretofore suggested to color the same to distinguish the insecticide from harmless substances.

As one of the principal objects, this invention aims to provide insecticides which are in finely divided condition and are readily free-flowing. A further particular object of the invention lies in the provision of an economical method by which the insecticidal substances may be made free-flowing without interfering materially with the procedure normally employed for the production of such materials. The present improvements additionally contemplate the production of finely divided free-flowing insecticides having a characteristic color appearance which will prevent such substances from being mistaken for non-poisonous materials. The process of the invention also includes a procedure by means of which the coloring material may be applied to the insecticide salt during the manufacture thereof substantially without the use of additional steps other than those employed in the manufacture of the insecticidal substances by the usual methods.

In accordance with the invention, it has been found that salts, such as sodium fluoride and similar materials used as insecticides or for other purposes where free-flowing properties in salts are desired, may be rendered free-flowing by in-

corporating therewith soap in relatively small quantities. Although the soap may be admixed mechanically with the salt, it has been discovered by the present improvements that the soap may be associated with salts, such as sodium fluoride and similar materials which are produced by precipitation or crystallization from solution without in any manner substantially interfering with or interrupting the process of producing the salts, by forming a solution of the particular soap to be employed and applying the soap solution to the salts after separation of the latter from the mother liquor in which they are formed, and while the salts are still damp with wash water or mother liquor but prior to the final drying and grinding of the salts. In accordance with this preferred mode of procedure, the salts while still damp or wet with mother liquor or washing liquid are mixed with a water solution of soap, and are thereafter dried to remove the adhering liquid carried by the damp salts. Where it is desired to produce an insecticide containing coloring matter in addition to having free-flowing properties, a solution of coloring material is likewise preferably added to the wet salts just prior to drying. By operating in this manner, soap, and coloring material if desired, may be associated with the insecticide substantially without use of operating steps other than those usually employed in the manufacture of the salt.

In carrying out the invention, to produce free-flowing sodium fluoride, sodium fluoride is prepared in the usual manner by adding soda ash to hydrofluoric acid solution in amount sufficient to approximately neutralize the acid. The resulting finely divided precipitate of sodium fluoride is then separated from the resulting mother liquor by any suitable means, for example, a centrifuge, and the damp salt is passed to a drier by any suitable means, for example, a screw conveyor. A water solution of a suitable soap, for example, a 10% solution of laundry soap, is made up, and the solution added to the damp salt while the latter is being passed from the centrifuge to the drier by the conveyor. The amount of soap solution added is regulated so as to include in the resulting product, when dried, the desired amount of soap.

By the present invention, it has been found that the incorporation in the final product of as little as about 0.25% by weight of soap produces satisfactory results rendering the insecticide remarkably free-flowing and facilitating dusting of the same from sifter cans and dust guns. The

amount of soap associated with the insecticide may vary considerably. Good results may be obtained where the soap content of the product is as low as 0.15%. However, it is preferred to include in the final product approximately around .25% soap. Particularly satisfactory results may be obtained where this amount of soap is introduced in the form of a solution. Where a mechanical mixture of salt and soap is made, it may be desirable to employ larger quantities of soap, say up to 1% by weight. Generally, it is preferred to use not less than about 0.15% by weight. Quantities of soap in excess of 1% may be employed where found desirable.

Sodium fluoride formed as noted above by neutralization of hydrofluoric acid with soda ash comprises a major portion of sodium fluoride, and small amounts of sodium sulfate, sodium silico fluoride, sodium chloride, sodium bicarbonate and water as impurities, the impurities resulting from the use of commercial hydrofluoric acid and soda ash. Generally speaking, in the manufacture of sodium fluoride by the procedure contemplated by the present invention, the product produced contains slightly in excess of 95% sodium fluoride, and the preferred embodiment of the invention comprises association of a desired amount of soap with insecticidal compositions containing approximately 95% sodium fluoride. Hence, subsequent to addition of the preferred amount of soap, i. e., about .25%, the preferred products contain about say, 95% sodium fluoride. The specific sodium fluoride content of the products is not controlling, and in some instances the sodium fluoride content of the insecticidal products may run as low as 85%, the balance including impurities derived from the raw materials employed in making the sodium fluoride, and/or substances which may be purposely added to the products to effect dilution thereof. Where it is desired to make insecticidal compositions having a sodium fluoride content substantially less than approximately 95%, suitable diluents, such as sodium sulfate, may be added to lower the sodium fluoride content to the desired extent. Where the product is diluted, the diluting material may advantageously be added to the salt as the latter in the damp condition passes from the centrifuge to the drier. The diluting material thus becomes thoroughly admixed with the product.

Where it is desired to manufacture a free-flowing colored insecticide, a water solution of a dye, for example an alkali fast green dye, may be formed and added to the finely divided salt as the latter is transferred from the centrifuge to the drier. In this procedure also, the quantity of dye employed is regulated so as to give the desired color sought. For example, a satisfactory colored sodium fluoride may be obtained by using an amount of a suitable water soluble dye equal to about two pounds of dye in water solution to one ton of sodium fluoride.

When the process of the invention is carried out in such manner, the action of the screw conveyor which moves the damp salt from the centrifuge to the drier effects a certain amount of mixing with the salt of the soap solution, the dye solution, and the diluting material if used, while the subsequent agitation of the salt in the drier effects thorough commingling with the sub-

stances involved. The soap and the coloring material, and diluting material if employed, are thus uniformly distributed throughout the salt. The salt while being agitated is simultaneously dried, and may be heated to remove moisture and volatile constituents from the salt. The dried, finely divided salt containing soap, coloring matter, diluting material, or any one or combination of these, may be further ground and pulverized in the usual manner.

The steps of drying, grinding and pulverizing the material in practicing the process are the same as those ordinarily employed in treating salts such as sodium fluoride to prepare the same for use as insecticides, and consequently the process of the invention does not materially alter the procedure now employed in treating such materials.

Soap may be incorporated with the salt in the dry form and not in water solution. In this instance, the dried soap may be admixed by any suitable means with the sodium fluoride after the latter has been discharged from the drier. It has been found, however, that the results obtained by incorporating the soap in the dry powdered condition with the salts are not as satisfactory as where the soap is introduced in the form of a soap solution while the salts are in the damp condition. It appears that where the soap is added to the salt in water solution, a soap film is formed about the individual particles of the salt which film seems to maintain the salt particles in the separated condition, preventing the fine material constituting the products from clinging together. Irrespective of whether or not a film of soap is actually formed around the individual particles of the product, in accordance with the invention it has been found that the best results are obtained where soap is added to the damp salt in the form of a water solution rather than incorporated in the dry condition with the finished product.

While for illustrative purposes, the invention has been described in connection with the manufacture of sodium fluoride, the principles of the invention may be utilized in the production of other salts which in use are distributed from sifter cans, dust guns and the like. In place of laundry soap other soaps may be used if desired.

I claim:

1. The method of producing free-flowing sodium fluoride which comprises precipitating sodium fluoride from solution, separating the bulk of the solution from the precipitated salt to form a body of salt in damp condition, forming a water solution of soap, then adding said solution to the precipitated sodium fluoride while the salt is still damp from the separator, and then drying the sodium fluoride.

2. The method of producing free-flowing relatively water insoluble insecticidal salts which comprises forming from a solution the water insoluble precipitate of the salt, separating the precipitated salt from the bulk of said solution to form a body of salt in damp condition, forming a water solution of soap, then adding said solution to the precipitated salt while the salt is still damp after the separating operation, and then drying the salt.

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