Patented June 6, 1939 2,161,035

UNITED STATES PATENT OFFICE

2,161,035

METHOD OF MAKING PHOSPHATE-SULPHUR FERTILIZER

Howard W. Gilbert, Washington, D. C., assignor to Freeport Sulphur Company, New York, N. Y., a corporation of Delaware

No Drawing. Application July 27, 1937, Serial No. 155,915

7 Claims. (Cl. 71—37)

The present invention relates to a method of making fertilizers, more particularly fertilizer compositions including as the major ingredients phosphate material and sulphur such, as for example, those described in the U. S. patent of John T. Claiborne, Jr., and Paul D. Petersen, No. 2,097,446, issued November 2, 1937.

A general object of the invention is the provision of an efficient, simple, unusually cheap and readily practiced method of making particulated fertilizer, each particle of which includes particles of phosphate fertilizer material bound together by sulphur, which is efficiently resistant to fracture and will remain in soil for an unusually long period of time while allowing acid formed by gradual oxidation of the sulphur to act freely with the phosphate without interference with soil bases, the method being particularly characterized by improvement of the bonding action of the sulphur.

More specific objects are the provision of such a method characterized by improvement of the bonding action of the sulphur by adjustment of the pH, and the obtainment of an unusually high yield of fertilizer pellets from such an acidulated phosphate-sulphur mixture upon pelletization while the sulphur is in a molten state.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the several steps and the relation of one or more of such steps with respect to each of the others thereof, which will be exemplified in the method hereinafter disclosed, and the scope of the invention will be indicated in the claims.

In accordance with the present invention a phosphate fertilizer material in particulated form is mixed with molten sulphur and fertilizer particles comprising particles of phosphate material bound together by sulphur are formed from the sulphur. The mixture is acidulated by adding an acidic substance to the sulphur prior to mixing with the phosphate material, or by adding such substance to the phosphate-sulphur mixture, or by acidulating the sulphur in any other suitable manner. Preferably previously acidulated molten sulphur is poured or sprayed into a mass of particles of phosphate fertilizer material which, if desired, may be preheated. The mixture is then stirred in any suitable mixer of proper design and is subdivided into particles, preferably by pelletizing, while the sulphur is in the molten state but, if desired, by comminuting.

The tricalcium phosphate material may be any suitable phosphate fertilizer material which will meet the requirements of the soil to be amended and will not be deleteriously affected by the method of preparation of the fertilizer. Many tricalcium phosphate materials are suitable, for example, natural phosphates including phosphate rock; and the so-called artificial phosphates which are the products or by-products of various industrial processes, such as bone meal, and the like. The phosphate material which is suitable for use in accordance with the present invention is not necessarily of the type which will not be altered to any appreciable extent by temperatures encountered in the procedure, such as up to about 260° C., but must be of a nature such that even though subject to alteration by such temperatures it will be suitable as an ingredient of a fertilizer composition and a source for plant demands, such as phosphoric acid, when the fertilizer is applied to the soil. The preferred tricalcium phosphate material is readily available in the form of phosphate rock.

The amount of sulphur preferably constitutes between about 20% and 30% of the mixture so that porous pellets are obtained each of which includes particles of phosphate material bound together by sulphur in proportions whereby the ingredients are in their most available forms and most satisfactory with respect to the requirements made by the soil. Although this is the preferred range of the amount of sulphur with the use of improved mixing equipment it may be possible, in the present invention, to lower the amount of sulphur, for example, to amounts as low as 10% to 15%. Amounts of sulphur greater than 20% to 30% may also be used in the production of particulated phosphate-sulphur fertilizer when the porosity is of less importance than other features and when heavy coatings of sulphur on the particles of phosphate material do not retard to an undesirable degree the reactions which are to take place in the soil. Such a composition having a high percentage of sulphur, e. g. 50% or more, would be used as a soil amendment in the treatment of alkaline soils, the excess sulphur being oxidizable into sulphuric acid for making the soil less alkaline and thus more suitable for plant growth while permitting within a reasonable time after application access to the particles of phosphate material for the production of phosphoric acid, etc.

A particular feature of the invention consists of adjusting the pH of the fertilizer mixture prior to the formation of the fertilizer particles. This may be done in a number of ways, for example, the sulphur prior to addition to the particles of