United States Patent Office 3,085,870 Patented Apr. 16, 1963

3,085,870

GRANULAR MATERIALS

Bernard William Bradford, John Richard William Heslop, Leslie Waddington Lord, and Martin S. Bloom, all of Norton-on-Tees, England, assignors to Imperial Chemical Industries Limited, London, England, a corporation of Great Britain

No Drawing. Filed Apr. 3, 1960, Ser. No. 20,801
Claims priority, application Great Britain Apr. 13, 1959
1 Claim. (Cl. 71—64)

This invention relates to the production of compositions e.g. urea in granular form.

According to the present invention there is provided a process for the production of materials e.g. urea in improved granular form, which comprises passing pellets of the material suspended in a gas stream through a hot zone in a short interval of time whereby the surface of the granules is smoothed, and thereafter cooling them. Preferably the granules are coated as hereinafter described before being cooled.

The temperature of the hot zone will depend on the material being treated, but the range 800° to 1100° has been found suitable, especially 900° to 1000° C. The transit time is short, for example two seconds, preferably less than one second. Care is needed to ensure that the temperature and time of exposure in the hot zone do not result in damage to the material.

The granules of urea may be produced, for example, by pelleting powdered urea, for example in a Manesty machine, or in a Sprout Waldron pelleting machine, comprising a rotatable carrier of ring form with a plurality of dies radially disposed therein and one or more idler rollers positioned to co-operate with the interior surface of the carrier.

Suitable granules have a particle size of, for example, 1.5 to 4 mms., and preferably are capable of supporting a load of at least 2, preferably more than 4, pounds before crumbling.

The improved granules run smoothly, are substantially dust free, and have less tendency to aggregate in containers such as sacks as compared with ordinary granules of urea.

One suitable method of operation is to burn a gas, such as coal gas, with primary air in a burner to be described below, and feed the hot products of combustion into a hot zone comprising an open, cylindrical, stainless steel tube of 2¼" I.D. x 2'6" length, and of 0.125" wall thickness, conveniently inclined at an angle of 30° below the horizontal. The burner axis is also at 30° below the horizontal.

A suitable burner comprises a ½" I.D. copper tube fitted with an internal concentric copper tube of $1\frac{5}{32}$" O.D., forming an annulus of $\frac{1}{64}$" width. The nozzle of the outer tube is bevelled to prevent the flame spreading, and the nose of the inner tube is set back $\frac{3}{16}$". The gas is fed through the annulus and primary air is fed through the inner tube. The feed tube for the pellets is $1\frac{1}{32}$" O.D. and ¼" I.D., enters the aforesaid inner tube at its back end, and extends to ¼" from its tip.

When the 2¼" diameter tube has attained, at a point 6" from its top, a temperature of about 900° C. to 1000° C., and the stream issuing from the bottom is about 1100° C., introduction of the pellets through the feed tube commences. The pellets are entrained in the air stream and then in the stream of hot combustion products, and are rapidly propelled through the hot zone. On egress from the cylindrical tube they fall by gravity into a suitable container.

In order to prevent the pellets becoming overheated it

may be desirable to increase the slope of the tube so as to propel them more rapidly through the hot zone. Preferably in this method of operation both the tube and the burner tubes are vertical.

On the large scale the heating zone may comprise a vertical tubular calciner heated by a stream of hot gas from a furnace, which stream is introduced through a narrower tube at the bottom. The granules of urea are introduced a short distance above the gas entry and are propelled through the calciner by the gas stream and taken off at the top of the calciner and rapidly cooled.

If desired conditions within the tube may be modified to give either oxidising or reducing atmospheres or other materials such as formaldehyde may be present during the heat treatment.

As already indicated according to a further important feature of the invention, particulate material is applied to the surfaces of the granular particles while they are in a softened or molten condition. This serves as an additional anti-caking treatment. Thus finely powdered material infusible at the temperatures used may be introduced, for example, with the pellets through the pellet-feed tube, or may be blown in near the top of the tube forming the hot zone, or even at the bottom thereof.

Alternatively, and with better results, the pellets issuing from the hot zone are propelled immediately into an unpacked bed of particulate material, e.g. the brand of calcium carbonate sold under the registered trademark "Winnofil," which is contained in the collecting receptacle for the pellets. This is a precipitated calcium carbonate containing small proportions of stearic acid, e.g. about 2.5% by weight. Other coating materials are china clay and plaster of Paris. A suitable proportion of the coating material is from 1% to 3%, preferably about 2%, by weight of the granules.

The process of the invention is also applicable to mixed fertilizers containing urea, for example to mixtures of urea with ammonium sulphate and/or potassium chloride.

An example of another material to which the invention is applicable is fertilizer compositions containing up to 20% of ammonium nitrate, e.g. one containing about 10% of ammonium nitrate, 70% of ammonium sulphate and 20% of potassium chloride by weight.

We claim:

Process for the production of urea fertilizer material in improved granular form which comprises passing solid urea fertilizer granules of a particle size of from about 1.5 to 4 mm. substantially free from water and suspended in a gas stream out of contact with one another, through a hot zone maintained at 800°–1100° C., in an interval of time of not more than about two seconds, whereby the surface of the granules is thermally smoothed without their shape being substantially altered by fusion, coating the surface of the granules while said surface is in a softened condition, with a particulate material in amount of at least 1% by weight of the granules and selected from the group consisting of a mixture of calcium carbonate and stearic acid, china clay and plaster of Paris, and thereafter quickly cooling said coated granules.

References Cited in the file of this patent

UNITED STATES PATENTS

2,334,578	Potters	Nov. 16, 1943
2,529,466	Weldon	Nov. 7, 1950
2,739,036	Kemenjar et al.	Mar. 20, 1956
2,798,801	Kieffer et al.	July 9, 1957
2,911,669	Beckwith	Nov. 10, 1959
2,926,079	Smith	Feb. 23, 1960
2,938,233	Nack et al.	May 31, 1960