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Commentary

Insights into the production and classification of fertilizers

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DESCRIPTION

Production of fertilizers

The Haber-Bosch process produces ammonia (NH_3), which is used to make nitrogen fertilisers. The hydrogen (CH_4) is commonly supplied by natural gas (CH_4), and the nitrogen (N_2) is obtained from the air in this energy-intensive process. All other nitrogen fertilisers, such as anhydrous ammonium nitrate (NH_4NO_3) and urea ($CO(NH_2)_2$), need this ammonia as a feedstock.

The Atacama desert in Chile also has deposits of sodium nitrate ($NaNO_3$) (Chilean saltpetre), which was one of the first nitrogen-rich fertilisers employed around 1830. Fertilizer is still mined from it. The Ostwald technique also produces nitrates from ammonia.

Phosphate fertilizers

Phosphate fertilisers are manufactured from phosphate rock, which contains the phosphorus-containing minerals fluorapatite $Ca_5(PO_4)3F$ (CFA) and hydroxyapatite $Ca_5(PO_4)3OH$. Treatment with sulfuric (H_2SO_4) or phosphoric acids converts these minerals into water-soluble phosphate salts (H_3PO_4). This application is the driving force behind the large-scale manufacture of sulfuric acid. The nitrophosphate process, also known as the Odda process, involves dissolving phosphate rock containing up to 20% phosphorus (P) in nitric acid (HNO_3) to produce a combination of phosphoric acid (H_3PO_4) and calcium nitrate ($Ca(NO_3)_2$). This mixture can be used with a potassium fertiliser to create a compound fertiliser that quickly dissolves the three macronutrients N, P, and K.

Potassium fertilizers

Potash is a mixture of potassium minerals that is used to generate potassium fertilisers (chemical symbol: K). Because potash is water soluble, the primary effort in extracting this nutrient from the ore entails several purification stages, such as removing sodium chloride (NaCl) (common salt). Potash is sometimes referred to as K_2O for the sake of simplicity when discussing potassium content. Potassium chloride, potassium sulphate, potassium carbonate, or potassium nitrate is the most common potash fertilisers.

NPK fertilizers

NPK fertilisers can be produced in four different ways: Steam granulation, chemical granulation, compaction, and bulk blending are the four methods of granulation. Compound NPKs are made using the first three methods. Raw materials are combined and further granulated using steam as a binding agent during steam granulation. The process is depends on chemical reactions between liquid raw materials (such as phosphoric acid, sulphuric acid, ammonia) and solid raw materials (such as potassium chloride, recycle material) is known as Chemical granulation. Compaction implements high pressure to agglomerate dry powder materials. Lastly, bulk blends are produced by mixing straight fertilizers.

Organic fertilizers

Organic fertilizers are fertilizers that are naturally produced. Fertilizers are materials that can be added to soil or plants, in order to provide nutrients and sustain growth. Organic fertilisers are commercially available and frequently packaged products that strive to meet the standards and guidelines set forth by “organic agriculture” and “environmentally friendly agriculture.” “Gardening is a term used to describe food and plant production systems that use synthetic fertilisers and pesticides in a way that is either limited or completely avoided. Typical “organic fertiliser” products include some organic elements as well as suitable additives such nutritious rock powders, ground sea shells (crab, oyster, etc.), other prepared products like seed meal or kelp, and grown microbes and derivatives.

Animal wastes, agricultural plant wastes, seaweed, compost, and treated sewage sludge are examples of organic fertilisers (biosolids). Aside from manures, animal sources can include items from animal slaughter, such as bloodmeal, bone meal, feather meal, hides, hoofs, and horns.

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