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HIGH SURFACE AREA ALUMINA COATINGS ON CATALYST SUPPORTS

Ralph Aarons, Wilmington, Del., assignor to E. I. du Pont de Nemours and Company, Wilmington, Del., a corporation of Delaware

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ABSTRACT OF THE DISCLOSURE

Catalyst supports having low surface area are coated with an aqueous colloidal boehmite-activated alumina composition, dried, and then calcined at about 500° C., to obtain a high surface area coating. The coating composition can optionally contain catalytic material or these materials can be subsequently applied to form a complete catalyst.

BRIEF SUMMARY OF THE INVENTION

This invention relates to processes for applying high surface area coatings to catalyst supports. More particularly, this invention relates to processes for applying high surface area coatings to catalyst supports having low surface area by the use of a composition of colloidal boehmite and finely divided, activated alumina.

To be useful in many gas phase reactions, many catalyst supports require that a high surface area coating be deposited upon the surface of the support. This deposit or coating should be easy to apply durable, and free from cracking.

It has been difficult to apply these high surface area coatings to catalyst supports without the use of materials which will adversely affect the catalytic activity. This is particularly true of rugged catalyst supports which are usually very dense, non-porous and have smooth surfaces.

I have found that if very finely divided, active alumina particles are combined with colloidal boehmite in an aqueous medium, a slurry is obtained which can be easily applied to the catalyst support. This slurry upon being dried and calcined provides a hard, durable, high surface area coating which is uniform and strongly adherent to the support.

This high surface area coating can subsequently be impregnated with various catalytic materials by processes well known in the art.

In another aspect, the slurry can contain the desired catalytic material. The thus modified slurry is applied, dried and calcined in the same manner and results in a highly active catalyst product. This latter process is preferred in that it avoids an additional step of applying the catalytic material separately.

The process of the invention can also be used to apply high surface area coatings on porous catalyst supports; however, the real advantages of the process are realized when it is used to apply the high surface area coatings to supports having smooth surfaces of low surface area.

DETAILED DESCRIPTION OF THE INVENTION

The support material on which the high surface area coating is to be applied may be any type of support material, i.e., porous or not; however, the process of the invention is particularly suited for use with supports having smooth surfaces or low surface area. Exemplary of useful support materials are the following: glass, metals, fused alumina, fused silica, mullite, beryl, zirconia, zircon, porcelain, dense sintered alumina, chromia, spinel, magnesia, fused magnesia, and titania.

The size and the form of the support is immaterial

and it can be orientated or unorientated, thus it can be in the form of a honeycomb or it could be in the form of pellets, random granules, spheres, corrugated shapes, bars, rods, tubes, rolls, spirals, screens, beads, coils, or any of the conventional shapes of the art.

Particularly preferred as support materials for use in this invention are thin-walled refractory ceramic structures which can be made by methods which have recently become known in the art. Such structures generally have a predetermined orderly shape, and are made up of ceramic sections ranging in thickness from say about 1 mil up to 250 mils or more. Examples of structures of this type are screens, tubes and tube bundles, plates, perforated sheets, and honeycombs. More complex and less common shapes are also contemplated since methods are now available for fabricating thin-walled ceramic structures in virtually any desired shape. These methods are described briefly below. No extended discussion is necessary since those skilled in the art are already familiar with the procedures.

U.S. Pat. 3,112,184 to Hollenbach describes a method for making thin-walled ceramic structures such as honeycomb. According to this method a suspension containing a finely divided sinterable ceramic material and a binding agent is applied to each side of a flexible carrier. The coated carrier is then molded into the desired shape and fired to sinter the ceramic. For example, in making honeycomb the coated carrier is corrugated and corrugated sheets are placed node to node or corrugated sheets are alternated with noncorrugated sheets to form a structure resembling a honeycomb. According to the disclosure, the carrier is preferably an organic fibrous material which will decompose under the conditions of sintering, but inorganic carriers which remain in the structure can also be used. Also according to the disclosure, this method can be used to produce ceramic structures of virtually any composition; examples include glasses such as borosilicates, soda-lime-silicates, lead-silicates, alumino silicates, refractories such as sillimanite magnesium silicate, magnesia, zircon, zirconia, petalite, spodumene, cordierite, corundum and the glass ceramics.

British Pat. 931,096, published July 10, 1963, discloses a similar method for making thin-walled ceramic articles. In this method, flexible sheets containing sinterable ceramic particles are formed then used to fabricate a structure of the desired shape. The assembly is then fired to sinter the ceramic particles and weld the sheets at points of contact. The sheets are made by mixing the ceramic particles with plasticizing ingredients such as organic polymers and forming the mix into thin films. The film is preferably formed on a carrier such as a thin metal foil which provides support during corrugation. After corrugation, the green film is removed from the support and is used in making a ceramic structure. The structure is then fired to sinter the ceramic particles. This method, according to the disclosure, is also applicable to a wide range of sinterable ceramic materials.

U.S. Pat. 3,255,027 to Talsma discloses a particularly suitable method for making the thin-walled ceramic structures useful as supports in the processes of this invention. In this method, aluminum foil is fabricated into a structure having the configuration of the desired final product and is fired under controlled conditions to oxidize the aluminum to alpha-alumina. Prior to the firing step aluminum is coated with a fluxing agent which serves to prevent inhibition of oxidation due to oxide scum formation on the surface of the aluminum. Examples of fluxing agents disclosed in the patent as being suitable include alkali metal and alkaline earth metal oxides and precursors of these oxides, i.e., compounds which yield the oxides on firing. A particularly suitable agent is sodium oxide which is applied as sodium silicate.