# PROCESS FOR COATING A CATALYST SUPPORT

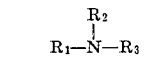
This invention relates to a process for applying high surface area coatings to catalyst supports having a low surface area. Thereafter, when catalytic materials are subsequently applied, a more effective catalyst is obtained.

The catalyst support used herein can be made of any dense, heat-resistant material capable of maintaining an alumina coating thereon, such as glass, metal, fused alumina, silica or magnesia, sintered alumina, zirconia, chromia, titania, etc., of any size or shape. The composition and preparation of these supports, as well as others, are disclosed, for example, in U.S. Pat. No. 3,112,184 to Hollenbach. Preferred among these supports are thin-walled refractory ceramic structures composed, for example, generally of a magnesium aluminum silicate.

Among the many coatings that can be applied to the catalyst supports defined above is alumina. The alumina can be added to the catalyst support by coating the same with an alumina sol, drying and then calcining at high temperatures. The sol can be prepared by digesting aluminum metal with a solution of an aluminum salt, such as aluminum chloride, and water.

We have found that the surface area of the alumina coating can be appreciably increased by treating the alumina with ammonia or an organic amine. After the alumina coating, that has been treated with ammonia or an amine, has been applied to the catalyst support, the resultant coated support can then be coated with a suitable catalytic metal, such as ruthenium. If desired, the catalytic metal can be added to the alumina sol and the resulting alumina coating on the catalyst support will then carry the desired catalytic metal.

Ammonia or any organic amine can be used herein. By an "organic amine" we mean to include any compound defined by the following structural formulae:



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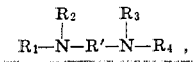
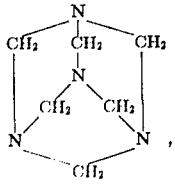
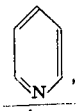


wherein $R_1$, $R_2$, $R_3$ and $R_4$, the same or different, can be hydrogen or alkyl, alkenyl, alknyl, cycloalkyl, cycloalkenyl, aryl or substituted derivatives thereof having from one to 20 carbon atoms, preferably from one to 10 carbon atoms, such as $CH_3$—, $C_2H_5$—, $C_3H_7$—, iso—$C_3H_7$, $C_4H_9$—, secondary—$C_4H_9$—, tertiary—$C_4H_9$, $C_5H_{11}$, cyclopentyl, cyclohexyl, $C_8H_{17}$—, $C_{10}H_{21}$—, $C_{15}H_{31}$—, $C_{19}H_{39}$—, $C_{20}H_{41}$—, 3-isopropylcyclohexyl, 3-phenylcyclopentyl, 2-phenylcyclohexyl, 2-methylcyclopentyl, phenyl, para-tolyl, benzyl, paramethylbenzyl, $CH_2$=CH—$CH_2$—, $CH_3$—CH=CH—$CH_2$—, $CH_2$=Ch—$CH_2$—$CH_2$—, CH ≡ C—$CH_2$—, CH ≡ C—$CH_2$—$CH_2$—, HO-$CH_2$—$CH_2$— , Cl-$CH_2$—$CH_2$—, $CH_3$—O—CH-$_2$—$CH_2$—, ortho-Cl—$C_6$—$H_4$—, para—Cl—$C_6H_4$—, meta-Cl—$C_6H_4$—, etc. In addition to the above amines, the following can also be used: compounds which contain a bridging nitrogen group, such as hexamethylenetetramine.

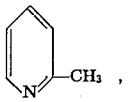


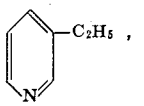


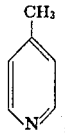
those that contain a basic nitrogen atom as part of aromatic ring, such as pyridine,

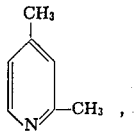


substituted pyridines, such as

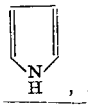




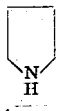




etc., compounds of the pyrrole,



and pyrrolidine,



classes and their derivatives, etc. Among amines that can be used are methylamine, dimethylamine, trimethylamine, ethylamine, diethylamine, triethylamine, n-propylamine, di-n-propylamine, tri-n-propylamine, n-butylamine, n-amylamine, n-hexylamine, laurylamine, ethylenediamine, trimethylenediamine, tetramethylenediamine, pentamethylenediamine, hexamethylenediamine, ethanolamine, diethanolamine, triethanolamine, allylamine, aniline, methylaniline dimethylaniline, diethylaniline, o-toluidine, m-toluidine, p-toluidine, o-nitroaniline, m-nitroaniline, p-nitroaniline, 2,4-dinitroaniline, o-phenylenediamine, m-phenylenediamine, p-phenylenediamine, o-anisidine, p-anisidine, p-phenetidine, o-chloroaniline, m-chloroaniline, p-chloroaniline, p-bromoaniline, 2,4,6-trichloroaniline, 2,4,6-tribromoaniline, diphenylamine, triphenylamine, benzidine, o-tolidine and o-dianisidine.

The treatment of the alumina sol will be dictated by the choice of amine. In order to facilitate the application of the alumina sol to the catalyst support, the same must be done without causing premature gelling of the