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Basicity of the electron donating properties of La_2O_3 activated at 300, 500, and 800 C and its mixed oxides with alumina compound

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ABSTRACT

Although investigations on the catalytic properties of rare earth sesquioxides have multiplied in recent years, the primary mode of surface interactions on these materials remains largely undefined. Details of adsorption/desorption **processes,** for example, and of the nature of adsorbed species on La_2O_3 surface are sparse. Esumi et al. studied the acid-base (electron donor-acceptor) interactions of electron acceptors like 7,7,8,8-tetracyanoquinodimethane, 2, 3, 5, 6 - tetrachloride- 1,4-benzoquinone, 2,5-dichloro- p - benzoquinone, p-dinitrobenzene and m-dinitrobenzene with MgO, Al_2O_3 SiO_2, TiO_2, ZnO and NiO[1]. The adsorption of electron acceptors on Y_3O_3 and on its mixed oxides with alumina have been investigated as a function of activation temperature to study and characterize their electronic properties.

Supported rare earth oxides are quite often used as catalysts for polymerization and for carbon monoxide hydrogenation'. Rare earth oxides have already been recognized as solid base catalysts°". In this paper we report surface electron donating properties and acid-base nature of Lab 3 activated at various temperatures and its mixed oxide with alumina. Since the electron donating properties depend on the nature of the medium, studies were carried out in two solvents; acetonitrile a very weak base and 1,4-dioxan a moderately weak base.

The electron donating properties of **La_2O_3** activated at 300, 500 and 800 C and its mixed oxides with alumina are reported from the studies on adsorption of electron acceptors of varying electron affinity on **La_2O_3**. The electron acceptors with their electron affinity values given in parenthesis are: 7,7,8,8-tetracyanoquinodimethane (2.84 eV), 2,3,5,6-tetrachloro-1,4-benzoquinone (2.40 eV) and p-dinitrobenzene (1 .77 eV). The basicity of the oxide has been determined by titration with n-butylamine and $H_{o,max}$ values are reported. The limit of electron transfer from the oxide to the electron acceptor is between 2.40 and 1.77 eV. It is observed that **La_2O_3** promotes the surface electron properties of alumina without changing its limit of electron transfer.