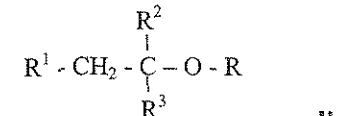
It was therefore an object of the embodiments disclosed hereinpresent invention to provide a cleavage catalyst which does not have one or more of these disadvantages.

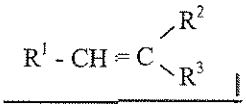
In a first aspect, there is provided a mixed oxide composition comprising a silicon-aluminium mixed oxide powder which is present predominantly or completely in the form of aggregated primary particles and in which a) the weight ratio $(Al_2O_3/SiO_2)_{ttl}$ in the overall primary particle is 0.002 to 0.05, preferably 0.003 to 0.015, more preferably 0.005 to 0.01, b) the weight ratio $(Al_2O_3/SiO_2)_{surface}$ of the primary particles in a layer close to the surface having a thickness of approx. 5 nm is less than in the overall primary particle and c) the BET surface area is 50 to 250 m^2/g, preferably 100 to 200 m^2/g; and alkali metal or alkaline earth metal oxides.

In a second aspect, there is provided the use of a mixed oxide composition as defined herein as a catalyst for cleaving a starting compound of the formula II



II

to isoolefins of the formula I



I

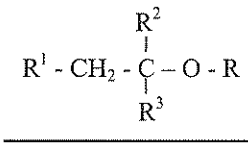
and a compound of the formula III



III

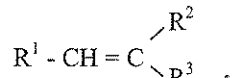
where the R radical in the formulae I to III is H or an alkyl radical having one or two carbon atom(s), the R1 radical is H, or a methyl or ethyl radical and the R2 and R3 radicals are each methyl or ethyl radicals, where the R2 and R3 radicals may be the same or different.

In a third aspect, there is provided a process for cleaving a starting compound of the formula II



II

to isoolefins of the formula I



I

and a compound of the formula III

R – OH III

where the R radical in the formulae I to III is H or an alkyl radical having one or two carbon atom(s), the R1 radical is H, or a methyl or ethyl radical and the R2 and R3 radicals are each methyl or ethyl radicals, where the R2 and R3 radicals may be the same or different, characterized in that a mixed oxide composition as defined herein is used as a catalyst.

It has now been found that, surprisingly, particular silicon- and aluminium-containing mixed oxide powders which have been produced using a silicon-aluminium mixed oxide prepared by flame hydrolysis or pyrogenic means have a high catalytic activity for the cleavage of alkyl tert-alkyl ethers or tertiary alcohols to isoolefin and alcohol or water with simultaneously very low formation of unwanted by-products. It may be advisable in some cases to dope these mixed oxides with alkali metal oxides or alkaline earth metal oxides.

The mixed oxides are prepared in the manner of flame hydrolysis, described inter alia in DE 198 47 161 A1, DE 196 50 500 A1, EP-A 0850 876 and Koth et al., Chem.-Ing.-Tech. 1980, 52, 628ff.

In what is called the "co-fumed process", volatile silicon and aluminium compounds, usually silicon tetrachloride and aluminium trichloride, are injected into an explosive gas flame of hydrogen and oxygen or air. The volatile silicon and aluminium compounds are hydrolysed by the water formed in the explosive gas flame to form the mixed oxide and the acid of the counterion of the silicon and aluminium compounds.

In the doping process used as an alternative, an aerosol is fed into a hydrogen/oxygen

gas flame in which an oxide, e.g. silicon oxide, is obtained from a volatile compound, e.g. silicon tetrachloride, by flame hydrolysis, said aerosol containing a salt of the element to be doped, e.g. aluminium, and the corresponding mixed oxide thus being formed.

In both processes, the resulting coproducts are subsequently removed in various steps, as described inter alia in DE 198 47 161 A1, DE 196 50 500 A1, EP-A 0850 876 and Koth et al., Chem.-Ing.-Tech. 1980, 52, 628ff.

The oxides or mixed oxides prepared by flame hydrolysis are notable for the following special features:

1. high chemical purity,
2. defined spherical primary particles,