Claims

1. Hydrolysis-resistant catalyst in the form of particles for the oxidative esterification of aldehydes to carboxylic esters, wherein the catalyst contains a) 0.01 to 10 mol% of gold, b) 40 to 94 mol% of silicon, c) 3 to 40 mol% of aluminium and d) 2 to 40 mol% of at least one further element selected from alkali metals, alkaline earth metals, lanthanoids having atomic numbers 57 to 71, Y, Sc, Ti, Zr, Cu, Mn, Pb and/or Bi, wherein components b) to d) are present as oxides and the stated amounts of components a) to d) relate to 100 mol% of the composition of the catalyst without oxygen,
wherein the catalyst has a shell structure composed of a core and at least one shell,
wherein at least 80% of the total amount of component a) is part of a shell,
wherein the catalyst has a PZC value between 7 and 11,
and wherein the catalyst except for the oxygen consists of components a) to d).

2. Catalyst according to Claim 1, wherein the catalyst includes between 0.05 and 2 mol% of component a).

3. Catalyst according to at least one of Claims 1 to 2, wherein component a) is in the form of particles having a mean diameter between 2 and 10 nm.

4. Catalyst according to at least one of Claims 1 to 3, wherein the catalyst particles have an average diameter between 10 and 200 µm and a spherical shape.

5. Catalyst according to at least one of Claims 1 to 4, wherein the catalyst includes between 2 and 30 mol% of Mg, Ce, La, Y, Zr, Mn, Pb and/or Bi as component d).

6. Catalyst according to at least one of Claims 1 to 5, wherein the catalyst has a core and two shells, wherein at least 80% of the total amount of component a) is within the inner shell.

7. Process for producing catalyst particles, wherein a basic mixed oxide support having a PZC value between 8 and 12 and a mean diameter between 10 and 200 µm, consisting of b) 40 to 94 mol% of silicon, c) 3 to 40 mol% of aluminium and d) 2 to 40 mol% of at least one further element selected from alkali metals, alkaline earth metals, lanthanoids having atomic numbers 57 to 71, Y, Sc, Ti, Zr, Cu, Mn, Pb and/or Bi, wherein components b) to d) are present as oxides and the stated amounts of components a) to d) relate to 100 mol% of the composition of the catalyst without oxygen, is admixed with a gold-containing solution to form a component a) having a pH between 0.5 and 5.0.

8. Process according to Claim 7, wherein the gold-containing solution contains at least one additional compound including components b), c) and/or d) in ionic form.

9. Use of a catalyst according to at least one of Claims 1 to 6 in the reaction of (meth)acrolein with oxygen and a monofunctional alcohol to give an alkyl (meth)acrylate.

10. Use according to Claim 9, wherein methacrolein is reacted with oxygen and methanol to give MMA.

11. Use of a catalyst according to at least one of Claims 1 to 6 in the reaction of (meth)acrolein with oxygen and a di-, tri- or tetrafunctional alcohol to give a hydroxyalkyl (meth)acrylate or to give a di-, tri- or tetra(meth)acrylate.

12. Use according to Claims 9 to 11, wherein the oxidative esterification is conducted continuously.

13. Use according to Claim 12, wherein the catalyst is present in suspension form in a stirred reactor during the oxidative esterification.