Claims:

1. Process for producing catalysts for the gas-phase oxidation of olefins, which comprises the steps:

(I) suspension of at least one pyrogenic metal oxide in a solvent,

(II) conversion of the metal oxide into an active state by producing a fine suspension by means of a dispersing apparatus and/or wet milling,

(III) coagulation of the suspension to give a paste-like mass,

(IV) conversion of the coagulated suspension into a shaped body,

(V) drying of the shaped body,

(VI) calcination of the shaped body obtained,

(VII) conversion of the shaped body into an active catalyst by application of one or more catalytically active compounds or one or more precursor compounds and/or one or more promoter compounds which can be converted in a subsequent step into one or more catalytically active compounds.

2. Process according to Claim 1, characterized in that one or more compounds from the group consisting of Si_xO_y, Al_xO_y, Ti_xO_y, Zr_xO_y, Ce_xO_y are used as pyrogenic metal oxide.

3. Process according to Claim 2, characterized in that SiO_2 is used as pyrogenic metal oxide.

4. Process according to any of Claims 1 to 3, characterized

in that water is used as solvent.

5. Process according to any of Claims 1 to 4, characterized in that the activation is carried out in a frictional mill, an annular gap mill or a stirred ball mill.

6. Process according to any of Claims 1 to 5, characterized in that the activation is carried out by means of one or more dispersing apparatuses from the group consisting of dissolvers, ultrasonic dispersers and planetary dissolvers.

7. Process according to any of Claims 1 to 6, characterized in that the preliminary suspension of the metal oxide in the solvent is omitted and the addition of the metal oxide to the solvent is carried out during the activation step.

8. Process according to any of Claims 1 to 7, characterized in that the suspension is activated for a period of from 0.5 to 4 hours.

9. Process according to any of Claims 1 to 8, characterized in that one or more auxiliaries from the group consisting of beads made of steel, glass, aluminium oxide, zirconium oxide, zirconium silicate, silicon carbide and silicon nitride are used as milling media.

10. Process according to any of Claims 1 to 9, characterized in that the pH during preliminary suspension and during the activation step is in the range from 2.0 to 4.0.

11. Process according to Claim 10, characterized in that the pH is regulated by means of hydrochloric acid, nitric acid, ammonia or an aqueous solution thereof.

12. Process according to any of Claims 1 to 11, characterized in that the solids content of the activated metal oxide suspension is from 5 to 40% by weight.

13. Process according to any of Claims 1 to 12, characterized in that the coagulation of the suspension is carried out by means of one or more measures selected from among alteration of the pH and further addition of one or more metal oxides.

14. Process according to any of Claims 1 to 13, characterized in that the coagulation of the suspension containing the activated metal oxide is carried out by setting the pH to a value in the range from 4 to 10.

15. Process according to any of Claims 1 to 14, characterized in that the coagulation of the suspension containing the activated metal oxide is carried out by further addition of one or more metal oxides.

16. Process according to any of Claims 13 to 15, characterized in that the adjustment of the pH and/or the addition of further metal oxide brings about a change in the rheology of the activated suspension.

17. Process according to any of Claims 1 to 16, characterized in that the shaping step is carried out by means of one or more measures from the group consisting of extrusion, tableting and pressing.

18. Process according to any of Claims 1 to 17, characterized in that the shaped bodies have the shape of rings, pellets, cylinders, wagon wheels or spheres.

19. Process according to any of Claims 1 to 18, characterized in that the shaped bodies obtained are dried at temperatures in the range from 25°C to 200°C.

20. Process according to any of Claims 1 to 19, characterized in that the calcination is carried out under an air atmosphere, with the oxygen content optionally being able

to be varied and a further gas optionally being added to the air.

21. Process according to any of Claims 1 to 20, characterized in that the calcination is carried out at temperatures in the range from 500°C to 1250°C.

22. Process according to any of Claims 1 to 21, characterized in that the shaped catalyst bodies formed have a BET surface area in the range from 30 m^2/g to 500 m^2/g.

23. Process according to any of Claims 1 to 22, characterized in that the addition of one or more promoter compounds is carried out in a separate step after conversion of the shaped bodies into a catalyst.

24. Process according to any of Claims 1 to 23, characterized in that, as an alternative to application of one or more catalytically active compounds or one or more precursor compounds together with one or more promoter compounds in one step, the application of one or more promoter compounds is carried out separately in a process step preceding or following the application of one or more catalytically active compounds or one or more precursor compounds.

25. Process according to any of Claims 1 to 24, characterized in that the shaped bodies are coated with one or more of the systems from the group consisting of Pd/Au/alkali metal compounds, Pd/Cd/alkali metal compounds and Pd/Ba/alkali metal compounds.

26. Process according to Claim 25, characterized in that the abovementioned components are applied by means of one or more measures from the group consisting of impregnation, spraying, vapour deposition, dipping, precipitation of the Pd and/or Au and/or Cd and/or Ba metal compounds on the support, reduction of the reducible metal compounds

applied to the support, washing to remove any chloride present, impregnation with alkali metal acetate or alkali metal compounds, in an appropriate order.

27. Process according to Claims 26, characterized in that potassium compounds are used as alkali metal compounds.

28. Process according to any of Claims 1 to 27, characterized in that the application of various noble metal compounds is carried out in one step or in a plurality of successive steps and one or more steps selected from the group consisting of intermediate drying, calcination or reduction are optionally carried out between these steps.

29. Process according to any of Claims 1 to 28, characterized in that any chloride present on the support is removed by thorough washing before and/or after reduction of the noble metal compounds.

30. Process according to any of Claims 29, characterized in that the washing of the catalyst is carried out by means of water or a basic aqueous solution having a pH of > 7.

31. Process according to any of Claims 1 to 28, characterized in that the catalyst obtained comprises, based on the weight of the support used, one or more components from the group consisting of from 0.1 to 5.0% by weight of palladium, from 0.2 to 3.5% by weight of gold, from 0.1 to 3.5% by weight of cadmium, from 0.1 to 3.5% by weight of barium and from 0.5 to 15% by weight of potassium.

32. Process according to any of Claims 1 to 31, characterized in that the noble metal concentration is constant within the support body.

33. Process according to any of Claims 1 to 32, characterized in that the noble metal concentration decreases from the accessible outer surface in the direction of the interior

of the support.

34. Process according to any of Claims 1 to 33, characterized in that the sum of all impurities in the catalyst is less than 400 ppm.

35. Catalyst obtainable by the process according to one or more of Claims 1 to 34.

36. Catalyst according to Claim 35, characterized in that the shaped body has a sum of impurities (all other metals and also carbon and phosphorus and sulphur) of less than 400 ppm.

37. Use of the catalyst according to any of Claims 35 to 36 as catalyst in chemical reactions.

38. Use of the catalyst according to any of Claims 35 to 36 as supported catalyst for preparing unsaturated esters from olefins and/or organic acids.

39. Use of the catalyst according to any of Claims 35 to 36 as supported catalyst for the production of vinyl acetate monomer.

The invention claimed is:

1. A process for producing catalysts for the gas-phase oxidation of olefins, which comprises the steps:

(1) suspending at least one pyrogenic metal oxide in a liquid phase to form a suspension,

(2) converting the metal oxide into an active state in a continuous phase by producing a fine metal oxide dispersion by means of a dispersing apparatus and/or wet milling,

(3) coagulating the dispersion to obtain a viscoelastic mass,

(4) shaping the viscoelastic mass into a shaped body,

(5) drying the shaped body,

(6) calcining the shaped body obtained in step (5), to form a calcined shaped body,

(7) converting the calcined shaped body into an active catalyst by applying one or more catalytically active compounds or catalyst precursor compounds which can be converted in a subsequent step into one or more catalytically active compounds, and optionally applying one or more promoter compounds.

2. The process of claim 1, wherein the at least one pyrogenic metal oxide is selected from the group consisting of oxides of silicon, aluminum, titanium, zirconium, and cerium.

3. The process of claim 2, wherein the at least one pyrogenic metal oxide is SiO_2.

4. The process of claim 1, wherein the continuous phase comprises water.

5. The process of claim 1, wherein the step of converting the pyrogenic metal oxide into an active state is carried out in a frictional mill, an annular gap mill or a stirred ball mill.

6. The process of claim 1, wherein the step of converting the pyrogenic metal oxide into an active state is carried out by means of one or more dispersing apparatuses selected from the group consisting of dissolvers, ultrasonic dispersers and planetary dissolvers.

7. The process of claim 1, wherein suspending of the at least one pyrogenic metal oxide in a liquid phase is carried out during the step of converting the pyrogenic metal oxide into an active state.

8. The process of claim 1, wherein the suspension is activated for a period of from 0.5 to 4 hours.

9. The process of claim **1**, wherein one or more beads made of steel, glass, aluminum oxide, zirconium oxide, zirconium silicate, silicon carbide, or silicon nitride, are used as milling media in a stirred ball mill.

10. The process of claim **1**, wherein the pH during suspending the at least one pyrogenic metal oxide and during the step of converting the at least one pyrogenic metal oxide into an active state is in the range of from 2.0 to 4.0.

11. The process of claim **10**, wherein the pH is regulated by means of hydrochloric acid, nitric acid, ammonia, or an aqueous solution thereof.

12. The process of claim **1**, wherein the solids content of the activated pyrogenic metal oxide dispersion is from 5 to 40% by weight.

13. The process of claim **1**, wherein coagulation of the pyrogenic metal oxide dispersion is achieved by adjusting the pH, further addition of one or more metal oxides, or a combination thereof.

14. The process of claim **1**, wherein coagulation of the pyrogenic metal oxide dispersion containing the activated pyrogenic metal oxide is achieved by adjusting the pH to a value in the range from 4 to 10.

15. The process of claim **1**, wherein coagulation of the pyrogenic metal oxide dispersion containing the activated pyrogenic metal oxide is carried out by further addition of one or more metal oxides.

16. The process of claim **1**, wherein shaping is carried out by extrusion, tableting, or pressing.

17. The process of claim **1**, wherein the shaped bodies have the shape of rings, pellets, cylinders, wagon wheels or spheres.

18. The process of claim **1**, wherein the shaped bodies are dried at temperatures in the range from 25° C. to 200° C.

19. The process of claim **1**, wherein calcining is carried out under an air atmosphere, with the oxygen content optionally varied, and a further gas optionally being added to the air.

20. The process of claim **1**, wherein calcining is carried out at a temperature in the range from 500° C. to 1250° C.

21. The process of claim **1**, wherein the shaped catalyst bodies formed have a BET surface area in the range from 30 m^2/g to 500 m^2/g.

22. The process of claim **1**, wherein the addition of one or more promoter compounds is carried out in a separate step after at least partial conversion of the shaped bodies into a catalyst by addition of the catalytically active compounds or catalyst precursor compounds.

23. The process of claim **1**, wherein application of one or more promoter compounds is carried out separately in a process step preceding or following the application of one or more catalytically active compounds or catalyst precursor compounds.

24. The process of claim **1**, wherein the shaped bodies are coated with one or more catalytic systems selected from the group consisting of Pd/Au/alkali metal compounds, Pd/Cd/alkali metal compounds and Pd/Ba/alkali metal compounds.

25. The process of claim **24**, wherein components of the one or more catalytic systems are applied in step (7) by means of impregnation, spraying, vapour deposition, dipping, precipitation of Pd and/or Au and/or Cd and/or Ba metal compounds on the shaped bodies, reduction of reducible metal compounds applied to the shaped bodies, washing to remove any chloride present, and impregnation with alkali metal acetate or alkali metal compounds, in an appropriate order.

26. The process of claim **25**, wherein potassium compounds are used as alkali metal compounds.

27. The process of claim **1**, wherein one or more noble metal compounds are applied as one or more catalytically active compounds or catalyst precursor compounds in one step or in a plurality of successive steps to a shaped body obtained in one or more of steps (4), (5), or (6), and one or more steps selected from the group consisting of intermediate drying, calcination, and reduction are optionally carried out between these successive steps.

28. The process of claim **1**, wherein noble metal compounds as one or more catalytically active compounds or catalyst precursor compounds are added to the shaped body in step (7), and chloride present on the shaped body is removed by thorough washing before and/or after reduction of noble metal compounds.

29. The process of claim 28, wherein washing of the catalyst is carried out by means of water or a basic aqueous solution having a pH of >7.

30. The process of claim 1, wherein the catalyst comprises, based on the weight of the shaped body used, one or more components from the group consisting of from 0.1 to 5.0% by weight of palladium, from 0.2 to 3.5% by weight of gold, from 0.1 to 3.5% by weight of cadmium, from 0.1 to 3.5% by weight of barium and from 0.5 to 15% by weight of potassium.

31. The process of claim 1, wherein a noble metal as a catalytically active compound is applied to the shaped body in step (7), and the concentration of the noble metal is constant within the support body.

32. The process of claim 1, wherein a noble metal as a catalytically active compound is applied to the shaped body in step (7), and the concentration of the noble metal decreases from an accessible outer surface in the direction of an interior of the shaped body.

33. The process of claim 1, wherein the sum of all impurities in the catalyst is less than 400 ppm.

34. The process of claim 1, wherein the shaped body has a sum of impurities of all other metals other than the metal of the pyrogenic metal oxide, carbon, phosphorus, and sulphur, of less than 400 ppm.

35. The process of claim 1, further comprising a step of oxidizing olefins and/or organic acids by contacting the olefin and/or organic acids with a catalyst obtained by the process of claim 1.

36. The process of claim 35, wherein said oxidizing step provides for the production of vinyl acetate monomer.

37. The process of claim 35, wherein said oxidizing step provides for the acetoxylation of olefins.