

What is claimed is:

1. A catalyst composite comprising:

a support comprising silica and about 1 to about 3 wt-% alumina, wherein the support has a surface area of about 175 to about 300 m²/g;

an eggshell layer on the support comprising Pd and Au.

2. The method of claim 1, wherein the catalyst composition comprises about 2 wt-% alumina.

3. The method of claim 1 or 2, wherein the eggshell layer further comprises potassium acetate in an amount of about 25 to about 60 g per liter of catalyst composition.

4. A method of making a catalyst composite, the method comprising:

providing a support comprising silica and about 1 to about 3 wt-% alumina, wherein the support has a surface area of about 175 to about 300 m²/g;

depositing Pd and Au onto the support to provide a support with an eggshell catalyst layer;

impregnating the support with eggshell catalyst layer with potassium acetate; and

reducing the support with eggshell catalyst layer at a temperature of about 90 °C to about 150 °C in a forming gas comprising hydrogen gas and nitrogen gas to form a catalyst composite.

5. The method of claim 4, wherein the hydrogen gas and nitrogen gas are present in a ratio range from about 5 to about 1 to about 1 to about 5.

6. The method of claim 4 or 5, wherein depositing Pd and Au onto the support to provide a support with eggshell catalyst layer comprises impregnating the support with a solution containing chloride salts of Pd and Au and subsequently contacting the support with a basic solution.

7. The method of any of claims 4-6, wherein impregnating the support with eggshell catalyst layer with potassium acetate comprises impregnating the support with a solution containing potassium acetate and drying said support.

8. A method of making a catalyst composite, the method comprising:

providing a support comprising silica and about 1 to about 3 wt-% alumina, wherein the support has a surface area of about 175 to about 300 m²/g;

depositing Pd and Au onto the support to form a support with eggshell catalyst layer;

reducing the support with eggshell catalyst layer at a temperature of about 200 to about 500 °C in a reducing gas comprising about 20% to about 100% hydrogen gas for about 1 to about 4 hours;

and impregnating the support with eggshell catalyst layer with potassium acetate.

9. The method of claim 8, wherein the reducing gas further comprises nitrogen gas or ethylene.

10. The method of claim 8 or 9, wherein the nitrogen and hydrogen gases are present in a ratio from about 5 to 1 to less than pure hydrogen.

11. The method of any of claims 8-10, wherein depositing Pd and Au onto the support to form a catalyst layer on the support comprises impregnating the support with a solution containing chloride salts of Pd and Au and subsequently contacting the support with a basic solution.

12. The method of any of claims 1-11, wherein impregnating the support with eggshell catalyst layer with potassium acetate comprises impregnating the support with a solution containing potassium acetate and drying said support under vacuum.

13. The method of any of claims 1-12, wherein the gold is present in an amount of about 0.9 to about 5 g per liter of catalyst composition and palladium is present in an amount of about 3 to about 10 g per liter of catalyst composition.

14. The method of any of claims 1-13, wherein the support has a surface area of about 200 to about 250 m²/g.

15. A method of producing vinyl acetate monomer, the method comprising contacting a gas comprising ethylene, acetic acid and oxygen with the catalyst composite of any of claims 1-14.

Claims:

1. A catalyst composite comprising:
 - a spherical support material comprising silica and about 1 to about 3 wt-% alumina,
 - 5 wherein the spherical support material has a surface area of about 175 to about 300 m²/g, and a diameter of about 3 mm to about 7 mm; and a deposit of Pd and Au onto the spherical support material;
 - wherein the catalyst composite comprises
 - an inner region; and
 - 10 an outer region;
 - wherein:
 - the outer region has a depth of less than about 500 μm from the surface of the catalyst composite;
 - the outer region comprising the Pd and Au; and
 - 15 the inner region being substantially free of the Pd and Au.
2. The catalyst composite of claim 1, wherein the catalyst composite comprises about 2 wt-% alumina.
3. The catalyst composite of claim 1 or 2, further comprising potassium acetate in an amount of about 25 to about 60 g per liter of catalyst composite.
- 20 4. A method of making a catalyst composite, the method comprising:
 - providing a spherical support material comprising silica and about 1 to about 3 wt-% alumina, wherein the spherical support material has a surface area of about 175 to about 300 m²/g, and a diameter of about 3 mm to about 7 mm;
 - depositing Pd and Au onto the spherical support material to provide a catalyst
 - 25 composite precursor comprising
 - an inner region; and
 - an outer region;
 - wherein:
 - the outer region has a depth of less than about 500 μm from
 - 30 the surface of the spherical support material;
 - the outer region comprising the Pd and Au; and
 - the inner region being substantially free of the Pd and Au;

impregnating the catalyst composite precursor with potassium acetate to form an
 impregnated catalyst composite precursor; and
 reducing the impregnated catalyst composite precursor at a temperature of about 90
 °C to about 150 °C in a forming gas comprising hydrogen gas and nitrogen
 5 gas to form the catalyst composite.

5. The method of claim 4, wherein the hydrogen gas and nitrogen gas are present in a ratio
 range from about 5 to about 1 to about 1 to about 5.

6. The method of claim 4 or 5, wherein the depositing comprises impregnating the
 spherical support material with a solution containing chloride salts of Pd and Au and
 10 subsequently contacting the spherical support material with a basic solution.

7. The method of any of claims 4-6, wherein the impregnating comprises impregnating the
 catalyst composite precursor with a solution containing potassium acetate and
 drying the impregnated catalyst composite precursor.

8. A method of making a catalyst composite, the method comprising:
 15 providing a spherical support material comprising silica and about 1 to about 3 wt-
 % alumina, wherein the spherical support material has a surface area of
 about 175 to about 300 m²/g, and a diameter of about 3 mm to about 7 mm;
 depositing Pd and Au onto the support material to form a catalyst composite
 precursor comprising:
 20 an inner region; and
 an outer region;
 wherein:
 the outer region having a depth from the surface to about 500
 μm of the catalyst composite precursor;
 25 the outer region comprising the Pd and Au; and
 the inner region being substantially free of the Pd and Au;
 reducing the catalyst composite precursor at a temperature of about 200 to about
 500 °C in a reducing gas comprising about 20% to about 100% hydrogen
 gas for about 1 to about 4 hours to form a reduced catalyst composite
 30 precursor;

and impregnating the reduced catalyst composite precursor with potassium acetate to form the catalyst composite.

9. The method of claim 8, wherein the reducing gas further comprises nitrogen gas or ethylene.
- 5 10. The method of claim 9, wherein the nitrogen and hydrogen gases are present in a ratio from about 5 to 1 to less than pure hydrogen.
11. The method of any of claims 8-10, wherein the depositing comprises impregnating the support material with a solution containing chloride salts of Pd and Au and subsequently contacting the support material with a basic solution.
- 10 12. The method of any of claims 8-11, wherein the impregnating comprises impregnating the support with a solution containing potassium acetate and drying the catalyst composite under vacuum.
13. The method of any of claims 4-12, wherein the gold is present in an amount of about 0.9 to about 5 g per liter of catalyst composite and palladium is present in an amount
15 of about 3 to about 10 g per liter of catalyst composite.
14. The method of any of claims 4-13, wherein the spherical support material has a surface area of about 200 to about 250 m²/g.
15. A method of producing vinyl acetate monomer, the method comprising contacting a gas comprising ethylene, acetic acid and oxygen with the catalyst
20 composite of claim 1.