We claim:

1. A process for producing ethanol, comprising hydrogenating acetic acid in the presence of a catalyst comprising:

a first metal selected from the group consisting of copper, iron, ruthenium, cobalt, nickel, rhodium, palladium, osmium, iridium, platinum, titanium, zinc, chromium, rhenium, molybdenum, and tungsten;

a second metal selected from the group consisting of copper, iron, ruthenium, molybdenum, tin, chromium, cobalt, vanadium, tungsten, palladium, platinum, lanthanum, cerium, manganese, rhenium, gold, and nickel, provided that the second metal is different than the first metal, wherein the content of the first metal is in an amount from 0.1 to 10 wt.%, preferably from 0.1 to 5 wt.%, and the content of the second is in an amount from 0.1 to 20 wt.%, preferably from 0.1 to 10 wt.%, based on the total weight of the catalyst;

a support, and

at least one support modifier is selected from the group consisting of (i) alkaline earth metal oxides, (ii) alkali metal oxides, (iii) alkaline earth metal metasilicates, (iv) alkali metal metasilicates, (v) Group IIB metal oxides, (vi) Group IIB metal metasilicates, (vii) Group IIIB metal oxides, (viii) Group IIIB metal metasilicates, and mixtures thereof.

2. The process of claim 1, wherein the support is selected from the group consisting of silica, silica/alumina, calcium metasilicate, pyrogenic silica, high purity silica, iron oxide, alumina, titania, zirconia, magnesium oxide, carbon, graphite, high surface area graphitized carbon, activated carbons, and mixtures thereof.

3. The process of any of the preceding claims, wherein the at least one support modifier is selected from the group consisting of oxides and metasilicates of sodium, potassium, magnesium, calcium, scandium, yttrium, and zinc.

4. The process of any of the preceding claims, wherein the at least one support modifier is present in an amount from 0.1 wt.% to 50 wt.%, based on the total weight of the catalyst.

5. The process of any of the preceding claims, wherein the support is present in an amount of 25 wt.% to 99 wt.%, based on the total weight of the catalyst.

6. The process of any of the preceding claims, wherein the support contains less than 1 wt.% of aluminum, based on the total weight of the catalyst.

7. The process of any of the preceding claims, wherein the first metal is platinum and the second metal is tin, and further wherein the molar ratio of platinum to tin is from 0.4:0.6 to 0.6:0.4.

8. The process of claims 1-7, wherein the first metal is palladium and the second metal is rhenium, and further wherein the molar ratio of rhenium to palladium is from 0.7:0.3 to 0.85:0.15.

9. The process of any of the preceding claims, wherein the catalyst further comprises a third metal different from the first and second metals, wherein the third metal is selected from the group consisting of cobalt, palladium, ruthenium, copper, zinc, platinum, tin, and rhenium, preferably present in an amount of 0.05 and 4 wt.%, based on the total weight of the catalyst.

10. The process of any of the preceding claims, wherein the acetic acid is obtained from a coal source, natural gas source or biomass source.

11. The process of any of the preceding claims, further comprising dehydrating the ethanol obtained during the hydrogenation to produce ethylene.

12. The process of any of the preceding claims, wherein the hydrogenation is performed in a vapor phase at a temperature of from 125°C to 350°C, a pressure of 10 kPa to 3000 kPa, and a hydrogen to acetic acid mole ratio of greater than 4:1.

13. The process of any of the preceding claims, further comprising continuously withdrawing a crude ethanol product formed by hydrogenating acetic acid, wherein the crude ethanol product comprises:

(a) ethanol in an amount from 15 to 70 wt.%;

(b) acetic acid in an amount from 0 to 80 wt.%;

(c) water in an amount from 5 to 30 wt.%; and

(d) any other compounds in an amount less than 10 wt.%,

wherein all weight percents are based on the total weight of the crude ethanol product.

14. The process of any of the preceding claims, wherein the first metal and the second metal are selected to provide a catalyst comprising a combination of metals selected from the group consisting of copper/chromium, copper/vanadium, copper/tungsten, copper/zinc, nickel/gold, nickel/rhenium, nickel/vanadium, nickel/tungsten, palladium/cobalt, palladium/chromium, palladium/copper, palladium/iron, palladium/lanthanum, palladium/molybdenum, palladium/nickel, palladium/rhenium, palladium/tin, palladium/vanadium, palladium/tungsten, platinum/cobalt, platinum/chromium, platinum/copper, platinum/iron, platinum/molybdenum, platinum/tin, rhenium/copper, rhenium/nickel, ruthenium/cobalt, ruthenium/chromium, ruthenium/copper, ruthenium/iron, ruthenium/lanthanum, ruthenium/molybdenum, ruthenium/nickel and ruthenium/tin.

15. The process of any of the preceding claims, wherein the catalyst may comprise a third metal, and wherein the first metal, second metal and third metal are selected to provide a catalyst comprising a combination of metals selected from the group consisting of platinum/tin/cobalt, platinum/tin/rhenium, platinum/tin/ruthenium and platinum/tin/palladium.

16. A process for producing ethanol, comprising hydrogenating acetic acid in the presence of a catalyst comprising:

$$Pt_vPd_wRe_xSn_yCa_pSi_qO_r,$$

wherein:

(i) the ratio of *v*:*y* is between 3:2 and 2:3, or (ii) the ratio of *w*:*x* is between 1:3 and 1:5; and *p* and *q* are selected such that p:q is from 1:20 to 1:200 with *r* being selected to satisfy valence requirements and *v* and *w* being selected such that:

$$0.005 \leq \frac{(3.25v+1.75w)}{q} \leq 0.05 .$$

We Claim:

1. A process for producing ethanol, comprising hydrogenating acetic acid in the presence of a catalyst comprising a first metal, a second metal, a silicaceous support, and at least one support modifier; wherein the first metal is selected from the group consisting of copper, iron, cobalt, nickel, ruthenium, rhodium, palladium, osmium, iridium, platinum, titanium, zinc, chromium, rhenium, molybdenum, and tungsten and wherein the second metal is selected from the group consisting of copper, molybdenum, tin, chromium, iron, cobalt, vanadium, tungsten, palladium, platinum, lanthanum, cerium, manganese, ruthenium, rhenium, gold, and nickel, provided that the second metal is different than the first metal.

2. The process of claim 1, wherein the first metal is present in an amount of from 0.1 to 25 wt. %, based on the total weight of the catalyst.

3. The process of claim 1, wherein the second metal is present in an amount of from 0.1 to 10 wt. %, based on the total weight of the catalyst.

4. The process of claim 1, wherein the at least one support modifier is selected from the group consisting of (i) alkaline earth metal oxides, (ii) alkali metal oxides, (iii) alkaline earth metal metasilicates, (iv) alkali metal metasilicates, (v) Group IIB metal oxides, (vi) Group IIB metal metasilicates, (vii) Group IIIB metal oxides, (viii) Group IIIB metal metasilicates, and mixtures thereof.

5. The process of claim 1, wherein the at least one support modifier is selected from the group consisting of oxides and metasilicates of sodium, potassium, magnesium, calcium, scandium, yttrium, and zinc.

6. The process of claim 1, wherein the at least one support modifier is present in an amount of 0.1 wt. % to 50 wt. %, based on the total weight of the catalyst.

7. The process of claim 1, wherein the support is present in an amount of 25 wt. % to 99 wt. %, based on the total weight of the catalyst.

8. The process of claim 1, wherein the support has a surface area of from 50 m.sup.2/g to 600 m.sup.2/g.

9. The process of claim 1, wherein the support is selected from the group consisting of silica, silica/alumina, calcium metasilicate, pyrogenic silica, high purity silica and mixtures thereof.

10. The process of claim 9, wherein the support contains less than 1 wt. % of aluminum, based on the total weight of the catalyst.

11. The process of claim 1, wherein the first metal is platinum and the second metal is tin and wherein the molar ratio of platinum to tin is from 0.4:0.6 to 0.6:0.4.

12. The process of claim 1, wherein the first metal is palladium and the second metal is rhenium and wherein the molar ratio of rhenium to palladium is from 0.7:0.3 to 0.85:0.15.

13. The process of claim 1, wherein the catalyst further comprises a third metal different from the first and second metals and wherein the third metal is selected from the group consisting of cobalt, palladium, ruthenium, copper, zinc, platinum, tin, and rhenium and wherein the third metal is present in an amount of 0.05 and 4 wt. %, based on the total weight of the catalyst.

14. The process of claim 1, wherein at least 10% of the acetic acid is converted during hydrogenation.

15. The process of claim 1, wherein the hydrogenation has a selectivity to ethanol of at least 80%.

16. The process of claim 15, wherein the hydrogenation has a selectivity to methane, ethane, and carbon dioxide and mixtures thereof of less than 4%.

17. The process of claim 1, wherein the catalyst has a productivity that decreases less than 6% per 100 hours of catalyst usage.

18. The process of claim 1, wherein the acetic acid is obtained from a coal source, natural gas source or biomass source.

19. The process of claim 1, further comprising dehydrating the ethanol obtained during the hydrogenation to produce ethylene.

20. The process of claim 1, wherein the hydrogenation is performed in a vapor phase at a temperature of from 125.degree. C. to 350.degree. C., a pressure of 10 KPa to 3000 KPa, and a hydrogen to acetic acid mole ratio of greater than 4:1.