We claim:

1. A catalyst for hydrogenating acetic acid to ethanol, the catalyst comprising:

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

a second metal selected from the group consisting of 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 total content of the first and second metals is in an amount from 0.1 to 25 wt.%, based on the total weight of the catalyst;

a support;

and from 0.2 to 25 wt.% of at least one metasilicate support modifier.

2. The catalyst 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 catalyst of any of the preceding claims, wherein the at least one metasilicate support modifier is selected from the group consisting of (i) alkaline earth metal metasilicates, (ii) alkali metal metasilicates, (iii) Group IIB metal metasilicates, (iv) Group IIIB metal metasilicates, and mixtures thereof.

4. The catalyst of any of the preceding claims, wherein the at least one metasilicate support modifier is selected from metasilicates of a metal selected from the group consisting of sodium, potassium, magnesium, scandium, yttrium, and zinc.

5. The catalyst of any of the preceding claims, wherein the at least one metasilicate support modifier comprises $CaSiO_3$.

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

7. The catalyst 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.

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

9. The catalyst of any of the preceding claims, 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.

10. The catalyst of claims 1-8, 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.

11. The catalyst of any of the preceding claims, wherein the second metal is present in an amount of from 0.1 to 10 wt.%, based on the total weight of the catalyst.

12. The catalyst of any of the preceding claims, wherein the catalyst further comprises a third metal different from the first metal and the second metal.

13. The catalyst of claim 12, 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.

14. The catalyst of any of the preceding claims, wherein the catalyst has a selectivity to ethanol of at least 80% and a selectivity to methane, ethane, and carbon dioxide of less than 4%.

15. A catalyst for hydrogenating acetic acid to ethanol, the catalyst satisfying the formula:

$$Pt_vPd_wRe_xSn_yCa_pSi_qO_r,$$

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 catalyst for hydrogenating acetic acid to ethanol, the catalyst comprising a first metal, a second metal, a silicaceous support, and from 0.2 wt. % to 25 wt. % at least one support modifier selected from the group consisting of oxides of any of calcium and zinc, and metasilicates of any of sodium, potassium, magnesium, calcium, scandium, yttrium, and zinc, and mixtures thereof, wherein the total content of the first and second metals is in an amount from 0.1 to 25 wt. %, based on the total weight of the catalyst and the first metal being selected from the group consisting of copper, iron, cobalt, nickel, ruthenium, rhodium, palladium, osmium, iridium, platinum, titanium, zinc, chromium, rhenium, molybdenum, and tungsten, and the second metal being selected from the group consisting of copper, molybdenum, tin, chromium, iron, cobalt, vanadium, tungsten, palladium, platinum, lanthanum, cerium, manganese, rhenium, and nickel, wherein the second metal is different than the first metal; and wherein the silicaceous support is selected from the group consisting of silica, silica/alumina, pyrogenic silica, high purity silica and mixtures thereof.

2. The catalyst of claim 1, wherein the at least one support modifier is selected from metasilicates of a metal selected from the group consisting of sodium, potassium, magnesium, scandium, yttrium, and zinc.

3. The catalyst of claim 1, wherein the at least one support modifier comprises CaSiO.sub.3.

4. The catalyst of claim 1, wherein the at least one support modifier is present in an amount of 0.5 wt. % to 15 wt. %, based on the total weight of the catalyst.

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

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

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

8. The catalyst of claim 1, wherein the first metal is platinum and the second metal is tin.

9. The catalyst of claim 8, wherein the molar ratio of platinum to tin is from 0.4:0.6 to 0.6:0.4.

10. The catalyst of claim 1, wherein the first metal is palladium and the second metal is rhenium.

11. The catalyst of claim 10, wherein the molar ratio of rhenium to palladium is from 0.7:0.3 to 0.85:0.15.

12. The catalyst 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.

13. The catalyst of claim 1, wherein the catalyst further comprises a third metal different from the first metal and the second metal.

14. The catalyst of claim 13, wherein the third metal is selected from the group consisting of cobalt, palladium, ruthenium, copper, zinc, platinum, tin, and rhenium.

15. The catalyst of claim 13, wherein the third metal is present in an amount of 0.05 and 4 wt. %, based on the total weight of the catalyst.

16. The catalyst of claim 1, wherein the catalyst is suitable for use as a hydrogenation catalyst in converting acetic acid to ethanol and yields an acetic acid conversion of at least 10%.

17. The catalyst of claim 16, wherein the catalyst has a selectivity to ethanol of at least 80%.

18. The catalyst of claim 17, wherein the catalyst has a selectivity to methane, ethane, and carbon dioxide of less than 4%.

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