CLAIMS

1. A process for preparing acrylic acid comprising:

(1) preparing acrolein by catalytic gas phase oxidation comprising

(a) providing a reaction gas comprising

(i) 5 to 10 mol % propylene,

(ii) 0.02 to 0.75 mol % propane, and

(iii) 0.25 to 1.9 mol % of a fuel mixture comprising at least one of methane and ethane,

wherein the molar ratio of the total amount of propane, methane, and ethane to the total amount of propylene is from 0.027:1 to 0.25:1;

(b) contacting the reaction gas with a first mixed metal oxide catalyst to form a mixture comprising acrolein, wherein the first mixed metal oxide catalyst comprises one or more of molybdenum, bismuth, cobalt, and iron; and

(2) contacting the acrolein mixture with a second mixed metal oxide catalyst to form a mixture comprising acrylic acid, wherein the second mixed metal oxide catalyst comprises one or more of molybdenum, vanadium, tungsten, copper, and antimony.

2. The process of claim 1, wherein the fuel mixture comprises methane.

3. The process of claim 1, wherein the reaction gas comprises propylene in an amount of from 7.5 to 8.2 mol %.

4. The process of claim 1, wherein the reaction gas comprises propane in an amount of from 0.03 to 0.62 mol %.

5. The process of claim 1, wherein the reaction gas comprises the fuel mixture in an amount of from 0.5 to 1.4 mol %.

6. The process of claim 2, wherein the reaction gas comprises methane in an amount of from 1.1 to 1.4 mol %.

7. The process of claim 1, wherein the molar ratio of the total amount of propane, methane, and ethane to the total amount of propylene is from 0.1:1 to 0.18:1.

8. The process of claim 1,

wherein the first mixed metal oxide catalyst comprises a primary component selected from the group consisting of molybdenum, bismuth, and combinations thereof, and a secondary component selected from the group consisting of cobalt, iron, nickel, zinc, tungsten, phosphorous, manganese, potassium, magnesium, silicon, aluminum, and combinations thereof, wherein the primary component and secondary component are in an atomic ratio of from 9:28 to 28:9, and

wherein the second mixed metal oxide catalyst comprises a primary component selected from the group consisting of molybdenum, vanadium, and combinations thereof, and a secondary component selected from the group consisting of tungsten, cobalt, copper, and combinations thereof, wherein the primary component and secondary component are in an atomic ratio of from 1:1 to 11:1.

9. The process of claim 1, wherein the fuel mixture comprises sulfur in an amount of less than 30 parts per million by volume of the fuel mixture.

10. A process for preparing acrylic acid comprising:

(1) preparing acrolein by catalytic gas phase oxidation comprising

(a) providing a reaction gas comprising

(i) 7.5 to 8.2 mol % propylene,

(ii) 0.03 to 0.62 mol % propane, and

(iii) 0.5 to 1.4 mol % of a fuel mixture comprising at least one of methane and ethane, wherein the fuel mixture comprises sulfur in an amount of less than 30 parts per million by volume of the fuel mixture,

wherein the molar ratio of the total amount of propane, methane, and ethane to the total amount of propylene is from 0.1:1 to 0.18:1; and

(b) contacting the reaction gas with a first mixed metal oxide catalyst to form a mixture comprising acrolein, wherein the first mixed metal oxide catalyst comprises a primary component selected from the group consisting of molybdenum, bismuth, and combinations thereof, and a secondary component selected from the group consisting of cobalt, iron, nickel, zinc, tungsten, phosphorous, manganese, potassium, magnesium, silicon, aluminum, and combinations thereof, wherein the primary component and secondary component are in an atomic ratio of from 9:28 to 28:9; and

(2) contacting the acrolein mixture with a second mixed metal oxide catalyst to form a mixture comprising acrylic acid, wherein the second mixed metal oxide catalyst comprises a primary component selected from the group consisting of molybdenum, vanadium, and combinations thereof, and a secondary component selected from the group consisting of tungsten, cobalt, copper, and combinations thereof, wherein the primary component and secondary component are in an atomic ratio of from 1:1 to 11:1.