CLAIMS

What is claimed is:

1. A method of making acrylic acid, acrylic acid derivatives, or mixtures thereof comprising contacting a stream comprising hydroxypropionic acid, hydroxypropionic acid derivatives, or mixtures thereof with a catalyst comprising:

c.monohydrogen monophosphate anion described by formula (I):

$[HPO_4]^{2-}$ (I),

d. and dihydrogen monophosphate anions described by formula (II):

$[H_2PO_4]^-$ (II), and

c. at least two different cations,

wherein the catalyst is essentially neutrally charged; and further, wherein the molar ratio of said monohydrogen monophosphate anion to said dihydrogen monophosphate anion in said catalyst is between about 0.1 and about 10.

2. The method of any preceding claim, wherein said stream further comprises:

(a) diluent; and

(b) inert gas selected from the group consisting of air, nitrogen, helium, argon, carbon dioxide, carbon monoxide, steam, and mixtures thereof.

3. The method of any preceding claim, wherein said stream is in the form of a gaseous mixture when contacting the catalyst.

4. The method of any preceding claim, wherein said diluent comprises water.

5. The method of any preceding claim, wherein said hydroxypropionic acid is lactic acid.

6. The method of any preceding claim, wherein the acrylic acid selectivity from said lactic acid is at least about 80%.

7. The method of any preceding claim, wherein the propionic acid selectivity from said lactic acid is less than about 1%.

8. The method of any preceding claim, wherein the conversion of said lactic acid is more than about 80%.

9. The method of any preceding claim, wherein said stream contacts said catalyst at a temperature of about 150°C to about 500°C.

10. The method of any preceding claim, wherein said lactic acid contacts said catalyst at a temperature of about 300°C to about 450°C.

11. The method of any preceding claim, wherein said hydroxypropionic acid, hydroxypropionic acid, or mixtures thereof are present in an amount between about 1 mol% and about 10 mol%, based on the total moles of said stream.

12. The method of any preceding claim, wherein said stream contacts said catalyst at a GHSV between about 720 h^{-1} and about 36,000 h^{-1}.

13. The method of any preceding claim, wherein said stream contacts said catalyst at a pressure between about 0 psig and about 550 psig.

14. The method of any preceding claim, wherein the partial pressure of water in said gaseous mixture is from about 10 psi to about 500 psi.

15. The method of any preceding claim, wherein said at least two different cations comprise:
    (a) at least one monovalent cation; and
    (b) at least one polyvalent cation.

CLAIMS

1. A method of making acrylic acid, acrylic acid derivatives, or mixtures thereof comprising contacting a stream comprising hydroxypropionic acid, hydroxypropionic acid derivatives, or mixtures thereof with a catalyst comprising:

a) monohydrogen monophosphate anion described by formula (I):

$[HPO_4]^{2-}$ (I),

b) and dihydrogen monophosphate anions described by formula (II):

$[H_2PO_4]^-$ (II), and

c) at least two different cations,

wherein the catalyst is essentially neutrally charged; and further, wherein the molar ratio of said monohydrogen monophosphate anion to said dihydrogen monophosphate anion in said catalyst is between about 0.1 and about 10.

2. The method of claim 1, wherein said stream further comprises:

a) diluent; and

b) inert gas selected from the group consisting of air, nitrogen, helium, argon, carbon dioxide, carbon monoxide, steam, and mixtures thereof.

3. The method of any one of the preceding claims, wherein said stream is in the form of a gaseous mixture when contacting the catalyst.

4. The method of any one of the preceding claims, wherein said diluent comprises water.

5. The method of any one of the preceding claims, wherein said hydroxypropionic acid is lactic acid.

6. The method of claim 5, wherein the acrylic acid selectivity from said lactic acid is at least about 80%.

7. The method of claim 5 or 6, wherein the propionic acid selectivity from said lactic acid is less than about 1%.

8. The method of any one of claims 5 to 7, wherein the conversion of said lactic acid is more than about 80%.

9. The method of any one of the preceding claims, wherein said stream contacts said catalyst at a temperature of about 150°C to about 500°C.

10. The method of any one of claim 5 to 9, wherein said lactic acid contacts said catalyst at a temperature of about 300°C to about 450°C.

11. The method of any one of the preceding claims, wherein said hydroxypropionic acid, hydroxypropionic acid, or mixtures thereof are present in an amount between about 1 mol% and about 10 mol%, based on the total moles of said stream.

12. The method of any one of the preceding claims, wherein said stream contacts said catalyst at a GHSV between about 720 h^{-1} and about 36,000 h^{-1}.

13. The method of any one of the preceding claims, wherein said stream contacts said catalyst at a pressure between about 0 psig and about 550 psig.

14. The method of any one of the preceding claims, wherein the partial pressure of water in said gaseous mixture is from about 10 psi to about 500 psi.

15. The method of any one of the preceding claims, wherein said at least two different cations comprise:

a) at least one monovalent cation; and

b) at least one polyvalent cation.