

CLAIMS

1. A catalyst composition comprising:
 (a) an inorganic catalyst support; and
 (b) a partially oxidized metal-organic component;
wherein the catalyst composition has (i) a loss-on-ignition of greater than 1 to 20 wt. % and
(ii) a carbon-as-carboxyl to total residual carbon ratio ($C_{\text{carboxy}}/C_{\text{total}}$) of at least 0.10 as
determined by X-ray photoelectron spectroscopy.
2. The catalyst composition of claim 1, further comprising a phosphorus component.
3. The catalyst composition of claim 2, wherein the phosphorus component is present in
an amount of from 1 to 10 wt. %, based on the bulk dry weight of the catalyst, calculated as
 P_2O_5 .
4. The catalyst composition of claim 1, wherein the metal portion of the partially
oxidized metal organic component comprises at least one Group VIB metal and at least one
Group VIII metal.
5. The catalyst composition of claim 4, wherein the at least one Group VIB metal is Mo
and the at least one Group VIII metal is Ni.
6. The catalyst composition of claim 1, wherein the organic portion of the metal-organic
component, prior to partial oxidation, is a hydroxycarboxylic acid.
7. The catalyst composition of claim 6, wherein the hydroxycarboxylic acid is selected
from the group consisting of glycolic acid, lactic acid, glyceric acid, gluconic acid, malic
acid, tartaric acid, mucic acid, and citric acid.
8. The catalyst composition of claim 1, having a loss-on-ignition of greater than 1 to 10
wt. %.
9. The catalyst composition of claim 1, having a $C_{\text{carboxy}}/C_{\text{total}}$ ratio of from 0.1 to 0.5.

10. A method for preparing the catalyst composition of claim 1, comprising:
- (a) impregnating an inorganic catalyst support with an aqueous solution containing (i) a salt of a Group VIB metal selected from Mo and W, (ii) a salt of a Group VIII metal selected from Co and Ni, and (iii) an organic acid;
- 5 (b) drying the impregnated catalyst support, thereby resulting in a metal-organic component on a dried catalyst precursor;
- (c) calcining the dried catalyst precursor in an oxygen-containing atmosphere for a time and temperature sufficient to oxidize some but not all of the organic portion of the metal-organic component, thereby resulting in a partially oxidized catalyst precursor having (i) a loss-on-
- 10 ignition of greater than 1 to 20 wt. % and (ii) a carbon-as-carboxyl to total residual carbon ratio ($C_{\text{carboxy}}/C_{\text{total}}$) of at least 0.10 as determined by X-ray photoelectron spectroscopy; and
- (d) sulfiding the partially oxidized catalyst precursor at sulfiding conditions in the presence of a sulfiding agent, thereby resulting in a sulfided catalyst composition.
- 15 11. The method of claim 10, wherein the organic acid is a hydroxycarboxylic acid.
12. The method of claim 11, wherein the hydroxycarboxylic acid is selected from the group consisting of glycolic acid, lactic acid, glyceric acid, gluconic acid, malic acid, tartaric acid, mucic acid, and citric acid.
- 20 13. The method of claim 10, wherein the calcining is carried out at a temperature of from 350°C to 500°C.
14. The method of claim 10, wherein the calcining is carried out at a time of from 5 to 15 minutes.
- 25 15. A process for hydrotreating a hydrocarbon feedstock, comprising: contacting the feedstock with a hydrotreating catalyst under hydrotreating conditions to produce a hydrotreated effluent, wherein the hydrotreating catalyst comprises the catalyst composition of claim 1.
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CLAIMS

1. A catalyst composition comprising a catalyst precursor, the precursor comprising:
 - (a) an inorganic catalyst support; and
 - (b) a partially oxidized metal-organic component;wherein the catalyst precursor has (i) a loss-on-ignition of greater than 1 to 10 wt. % and (ii) a carbon-as-carboxyl to total residual carbon ratio ($C_{\text{carboxy}}/C_{\text{total}}$) of at least 0.10 to 0.19 as determined by X-ray photoelectron spectroscopy.
2. The catalyst composition of claim 1, further comprising a phosphorus component.
3. The catalyst composition of claim 2, wherein the phosphorus component is present in an amount of from 1 to 10 wt. %, based on the bulk dry weight of the catalyst, calculated as P_2O_5 .
4. The catalyst composition of claim 1, wherein the metal portion of the partially oxidized metal organic component comprises at least one Group VIB metal and at least one Group VIII metal.
5. The catalyst composition of claim 4, wherein the at least one Group VIB metal is Mo and the at least one Group VIII metal is Ni.
6. The catalyst composition of claim 1, wherein the organic portion of the metal-organic component, prior to partial oxidation, is a hydroxycarboxylic acid.
7. The catalyst composition of claim 6, wherein the hydroxycarboxylic acid is selected from the group consisting of glycolic acid, lactic acid, glyceric acid, gluconic acid, malic acid, tartaric acid, mucic acid, and citric acid.
8. The catalyst composition of claim 1, having a loss-on-ignition of greater than 1 to 10 wt. %.
9. The catalyst composition of claim 1, having a $C_{\text{carboxy}}/C_{\text{total}}$ ratio of from 0.15 to 0.19.

10. A method for preparing the catalyst composition of claim 1, comprising:
- (a) impregnating an inorganic catalyst support with an aqueous solution containing (i) a salt of a Group VIB metal selected from Mo and W, (ii) a salt of a Group VIII metal selected from Co and Ni, and (iii) an organic acid;
 - (b) drying the impregnated catalyst support, thereby resulting in a dried catalyst precursor comprising a metal-organic component in or on the support;
 - (c) calcining the dried catalyst precursor in an oxygen-containing atmosphere for a time and temperature sufficient to oxidize some but not all of the organic portion of the metal-organic component, thereby resulting in a partially oxidized catalyst precursor having (i) a loss-on-ignition of greater than 1 to 10 wt. % and (ii) a carbon-as-carboxyl to total residual carbon ratio ($C_{\text{carboxy}}/C_{\text{total}}$) of at least 0.10 as determined by X-ray photoelectron spectroscopy; and
 - (d) sulfiding the partially oxidized catalyst precursor at sulfiding conditions in the presence of a sulfiding agent, thereby resulting in a sulfided catalyst composition.
11. The method of claim 10, wherein the organic acid is a hydroxycarboxylic acid.
12. The method of claim 11, wherein the hydroxycarboxylic acid is selected from the group consisting of glycolic acid, lactic acid, glyceric acid, gluconic acid, malic acid, tartaric acid, mucic acid, and citric acid.
13. The method of claim 10, wherein the calcining is carried out at a temperature of from 350°C to 500°C.
14. The method of claim 10, wherein the calcining is carried out at a time of from 5 to 15 minutes.
15. A process for hydrotreating a hydrocarbon feedstock, comprising: contacting the feedstock with a hydrotreating catalyst under hydrotreating conditions to produce a hydrotreated effluent, wherein the hydrotreating catalyst comprises the catalyst composition of claim 1.
16. The method of claim 10, wherein the precursor has a $C_{\text{carboxy}}/C_{\text{total}}$ ratio of from 0.1 to 0.19.