

CLAIMS

1. A catalyst composition comprising a catalyst precursor, the precursor comprising:
 - (a) an inorganic catalyst support, the support comprising a porous inorganic refractory selected from the group consisting of silica, alumina, alumina-silica, and the crystalline silica-aluminas; and
 - (b) a partially oxidized metal-organic component;wherein the catalyst precursor has:
 - (i) a loss-on-ignition of greater than 1 wt. % and up to 10 wt. %; and
 - (ii) a carbon-as-carboxyl to total residual carbon ratio ($C_{\text{carboxy}}/C_{\text{total}}$) of from 0.10 to 0.19 as determined by X-ray photoelectron spectroscopy; and
 - (iii) loss-on-ignition is determined using a test conducted by heating a sample of the partially oxidized catalyst precursor in an oxygen-containing atmosphere for 1 hour at 1020°F (549°C) and measuring weight loss after such heating; and
 - (iv) the metal portion of the partially oxidized metal organic component comprises at least one Group VIB metal and at least one Group VIII metal; and
 - (v) the organic portion of the metal-organic component, prior to partial oxidation, is a hydroxycarboxylic acid.
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 at least one Group VIB metal is Mo and the at least one Group VIII metal is Ni.
5. The catalyst composition of claim 1, 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.
6. The catalyst composition of claim 1, having a loss-on-ignition of greater than 1 wt.% and up to 8 wt. %.

7. The catalyst composition of claim 1, having a $C_{\text{carboxy}}/C_{\text{total}}$ ratio of from 0.15 to 0.19.
8. A method for preparing the catalyst composition of claim 1, comprising:
- (a) impregnating an inorganic catalyst support, the support comprising a porous inorganic refractory selected from the group consisting of silica, alumina, alumina-silica, and the crystalline silica-aluminas 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, wherein the organic acid is a hydroxycarboxylic 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 of from 1 minute to 1 hour and a temperature of from 350°C to 500°C, said calcining being 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 wt.% and up to 10 wt. %, wherein loss-on-ignition is determined using a test conducted by heating a sample of the partially oxidized catalyst precursor in an oxygen-containing atmosphere for 1 hour at 1020°F (549°C) and measuring weight loss after such heating; and
 - (ii) a carbon-as-carboxyl to total residual carbon ratio ($C_{\text{carboxy}}/C_{\text{total}}$) of from 0.10 to 0.19 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.
9. The method of claim 8, 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.
10. The method of claim 8, wherein the calcining is carried out at a temperature of from 350°C to 500°C.
11. The method of claim 8, wherein the calcining is carried out at a time of from 5 minutes to 1 hour.
12. 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.

13. The process of claim 12, wherein the catalyst precursor further comprises a phosphorus component.
14. The process of claim 13, 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 .
15. The process of claim 12, wherein the at least one Group VIB metal is Mo and the at least one Group VIII metal is Ni.
16. The process of claim 12, 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.
17. The process of claim 12, wherein the hydrotreating conditions include a temperature of from 302°F to 752°F (150°C to 400°C); a pressure of from 100 to 3000 psig (0.69 to 20.68 MPa); a liquid hourly space velocity or LHSV of from 0.1 to 10 h^{-1} ; and a hydrogen treat gas rate of from 500 to 10000 SCF/B (89 to 1780 m^3/m^3).