CLAIMS

1. A method of presulfurizing a catalyst, comprising:

contacting a catalyst with sulfur, olefin, and triglyceride to form a mixture;

specifying a weight ratio of the olefin to the triglyceride; and

heating the mixture to give a presulfurized catalyst for a hydroprocessing reactor.

2. The method of claim 1, wherein the contacting comprises:

contacting the catalyst with the sulfur to give an initial mixture comprising a sulfur-incorporated catalyst comprising pores impregnated with the sulfur;

specifying an amount of sulfur such that pores of the sulfur-incorporated catalyst in the initial mixture are not completely filled; and

contacting the initial mixture comprising the sulfur-incorporated catalyst with the olefin and the triglyceride to form the mixture, wherein the weight ratio is in a range of 0.4 to 0.6 to increase resistance of the presulfurized catalyst to sulfur stripping during startup of the hydroprocessing reactor in presence of a hydrocarbon feedstock.

3. The method of claim 2, wherein the heating comprises heating the initial mixture and heating the mixture, and wherein contacting the initial mixture with the olefin and the triglyceride fills pores of the sulfur-incorporated catalyst with a carbonaceous barrier comprising sulfur cross links between the olefin and the triglyceride.

4. The method of claim 1, wherein the contacting comprises:

contacting the catalyst with the sulfur in a first mix vessel to give a sulfur-incorporated catalyst, wherein the sulfur comprises elemental sulfur or a sulfur compound, or both; and

contacting the sulfur-incorporated catalyst with the olefin and the triglyceride in a second mix vessel at a contact time as a function of temperature and vapor pressure of the olefin comprising liquid olefin.

5. The method of claim 4, wherein the heating comprises:

heating the contacting of the catalyst with the sulfur to give the sulfur-incorporated catalyst, wherein the first mix vessel comprises a vibratory mixer or a rotary mixer; and

heating the contacting of the sulfur-incorporated catalyst with the olefin and the triglyceride to fill pores of the sulfur-incorporated catalyst with a carbonaceous barrier comprising elements carbon, hydrogen, and sulfur to give the presulfurized catalyst, wherein the first mix vessel and the second mix vessel are arranged operationally in series.

6. The method of claim 5, comprising:

receiving the sulfur-incorporated catalyst to the second mix vessel;

adding hydrogen to the presulfurized catalyst ex-situ of the hydroprocessing reactor, wherein the triglyceride comprises soybean oil, and the sulfur comprises elemental sulfur in powder form or molten form, or both, wherein the weight ratio is in a range of 0.4 to 0.6, wherein the carbonaceous barrier comprises elements oxygen or nitrogen, or both, and wherein the heating comprises heating the mixture in a substantially inert environment to at least 150 ºC.

7. The method of claim 6, comprising:

adding the catalyst and the sulfur in a single stream to the first mix vessel, wherein the catalyst comprises alumina-supported nickel-molybdenum catalyst or alumina-supported cobalt-molybdenum catalyst; and

discharging the presulfurized catalyst from the second mix vessel, wherein the heating comprises maintaining the mixture at a temperature of at least 180 ºC for a time in the range of about 0.1 hour to 10 hours, and wherein the heating facilitates formation of the carbonaceous barrier external on the presulfurized catalyst and within catalyst pores of the presulfurized catalyst to protect from deactivation by cracked feeds comprising light cycle oil (LCO) to the hydroprocessing reactor during initial start-up of the hydroprocessing reactor loaded with the presulfurized catalyst, wherein a majority of the carbonaceous barrier is within the catalyst pores.

8. The method of claim 2, wherein the catalyst comprises a metal oxide catalyst having one or more oxides of metals from Group VIB and Group VII of Periodic Table of Elements, and wherein the olefin comprises liquid olefins having carbon numbers in a range of 6 to 60, and wherein the contacting and the heating give a carbonaceous structure within and on the presulfurized catalyst to protect from diolefins and aromatics in cracked feedstock fed to the hydroprocessing reactor during initial startup of the hydroprocessing reactor after loading of the presulfurized catalyst.

9. A catalyst composition comprising:

a presulfurized catalyst formed by:

contacting a sulfidable catalyst with sulfur, olefin, and triglyceride at a specified weight ratio of the olefin to the triglyceride to form a mixture; and

heating the mixture.

10. The catalyst composition of claim 9, wherein the presulfurized catalyst comprises a presulfurized metal oxide catalyst having one or more oxides of metals from Group VIB and Group VII of Periodic Table of Elements, and wherein the presulfurized catalyst comprises a carbonaceous material within pores of the presulfurized catalyst for cracked feed protection, wherein the specified weight ratio is in a range of 0.4 to 0.6.

11. The catalyst composition of claim 9, wherein the sulfidable catalyst comprises a sulfidable metal oxide catalyst having one or more oxides of metals from Group VIB and Group VII of the Periodic Table of Elements, and wherein the presulfurized catalyst comprises a carbonaceous material inside pores of the presulfurized catalyst for cracked feed protection.

12. The catalyst composition of claim 11, wherein the olefin comprises olefins having carbon numbers in the range of 6 to 60, wherein the sulfidable metal

oxide catalyst comprises alumina-supported nickel-molybdenum catalyst or alumina-supported cobalt-molybdenum catalyst, wherein the triglyceride comprises soybean oil, and wherein the presulfurized catalyst comprises the carbonaceous barrier filled in pores of the presulfurized catalyst formed via the contacting and heating.

13. The catalyst composition of claim 14, wherein the heating comprises heating the mixture to at least 180 ºC, and wherein the olefin comprises liquid olefin and the sulfur comprises elemental sulfur in powder form.

14. The catalyst composition of claim 10, wherein the heating comprises maintaining the mixture at a temperature of at least 150 ºC for a time in a range of about 0.1 hour to 10 hours, wherein the presulfurized metal oxide catalyst comprises alumina-supported nickel-molybdenum catalyst or alumina-supported cobalt-molybdenum catalyst, wherein contact of the sulfidable catalyst with the sulfur gives a sulfur-incorporated catalyst, and wherein contact time of the sulfur-incorporated catalyst with the olefin and triglyceride to give the presulfurized catalyst is a function of vapor pressure and temperature of the olefin.

15. The catalyst composition of claim 9, wherein the contacting comprises:

contacting the sulfidable catalyst with the sulfur in a first mix vessel to give an initial mixture comprising a sulfur-incorporated catalyst; and

contacting the initial mixture comprising the sulfur-incorporated catalyst with the olefin and the triglyceride in a second mix vessel to form the mixture, wherein contact time of the initial mixture with the olefin and the triglyceride is correlative with vapor pressure and temperature of the olefin comprising liquid olefin.

16. The catalyst composition of claim 15, wherein the heating comprises heating the initial mixture and heating the mixture, and wherein the specified weight ratio is in a range of 0.4 to 0.6.

17. A method of hydroprocessing, comprising:

performing an initial startup of a reactor after loading of a presulfurized catalyst to form a hydroprocessed hydrocarbon product;

feeding hydrocarbon feed comprising cracked feedstock comprising coker naptha, coker diesel, or light cycle oil (LCO), or any combinations thereof, to the reactor within first three days of the initial startup;

contacting hydrogen, the presulfurized catalyst, and the hydrocarbon feed in the reactor, wherein the presulfurized catalyst is formed by heating in a mix vessel a mixture of a sulfidable catalyst, sulfur, olefin, and triglyceride at a specified weight ratio of olefin to triglyceride;

converting the presulfurized catalyst to a sulfided catalyst in the reactor; and

catalyzing, via the sulfided catalyst, hydroprocessing of the hydrocarbon feed in the reactor to give the hydroprocessed hydrocarbon product.

18. The method of claim 17, comprising loading the presulfurized catalyst into a fixed bed of the reactor, wherein converting comprises activating the presulfurized catalyst via contacting of the hydrogen with the presulfurized catalyst, wherein the hydrocarbon feed comprises at least 30 weight percent LCO, wherein the triglyceride comprises soybean oil, wherein the specified weight ratio is in a range of 0.4 to 0.6, wherein the presulfurized catalyst comprises a metal oxide catalyst having one or more oxides of metals from Group VIB and Group VII of the Periodic Table of Elements, and wherein the presulfurized catalyst comprises a carbonaceous barrier within pores of the presulfurized catalyst.

19. The method of claim 18, comprising discharging the hydroprocessed hydrocarbon product from the reactor, wherein the presulfurized catalyst comprises the carbonaceous barrier inside pores of the presulfurized catalyst formed via the heating of the mixture of the sulfidable catalyst, the sulfur, the olefin, and the triglyceride, wherein sulfiding agents are not employed in the reactor during the first three days of the initial startup, and wherein the hydroprocessing comprises hydrotreating, hydrocracking, or pygas treating, or any combination thereof.

20. The method of claim 19, wherein the metal oxide catalyst comprises alumina-supported nickel-molybdenum catalyst or alumina-supported cobalt-molybdenum catalyst, wherein the cracked feedstock comprises pyrolysis gasoline (pygas), and wherein the reactor comprises a pygas treater.