CLAIMS

1. A process for the selective hydrogenation of diolefins and sulphur compounds contained in a pyrolysis gasoline feedstock, comprising a diolefin concentration exceeding 3 wt % and an organic sulfur concentration exceeding 50 ppmw, wherein said process comprises:

introducing a hydrocarbon stream that comprises said pyrolysis gasoline feedstock into a reactor that contains a single hydrotreating reaction stage comprising hydrotreating catalyst and operated at selective hydrogenation conditions, wherein said hydrocarbon stream is contacted with said hydrotreating catalyst;

yielding from said reactor a reactor effluent comprising a reduced diolefin concentration of less than 10 ppmw, a reduced organic sulfur concentration of less than 3 ppmw, and an aromatics content of at least 90 wt % of a reactor inlet aromatics content;

separating said reactor effluent into a portion of said reactor effluent and a remaining portion of said reactor effluent;

and introducing as a recycle said portion of said reactor effluent into said reactor wherein the weight ratio of said recycle to said hydrocarbon stream is greater than 1:1.

2. A process as recited in claim 1, wherein said selective hydrogenation conditions include a feed inlet temperature to said reactor that is in the range of from 100° C. to 250° C., a reactor operating pressure in the range of from 10 bara to 100 bara, and a weight hourly space velocity in the range of from 0.2 to 40 hr^{-1}.

3. A process as recited in claim 2, wherein said pyrolysis gasoline feedstock further comprises monoolefins at a concentration in the range of from 1 to 20 wt % and aromatics at a concentration in the range of from 10 wt % to 80 wt %, and wherein said reactor effluent has a reduced monoolefin concentration as measured by a bromine number of less than 1 and aromatics content of at least 95 wt % of said hydrocarbon stream.

4. A process as recited in claim 2, wherein said hydrotreating catalyst comprises molybdenum and either nickel or cobalt supported on alumina.

5. A process as recited in claim 4, wherein said step of separating said reactor effluent includes:

separating said reactor effluent into a total reactor effluent portion of said reactor effluent and a total reactor effluent remaining portion of said reactor effluent; and

using said total reactor effluent portion as a total recycle stream of said recycle.

6. A process as recited in claim 4, wherein said step of separating said reactor effluent includes:

passing said reactor effluent to a separator for separating said reactor effluent into a liquid fraction and a vapor fraction;

passing said liquid fraction to a fractionator for separating said liquid fraction into a light cut and a heavy cut;

separating said heavy cut into a heavy cut portion of said heavy cut and a heavy cut remaining portion of said heavy cut; and

using said heavy cut portion of said heavy cut as a heavy cut recycle stream of said recycle.

7. A process as recited in claim 4, wherein said step of separating said reactor effluent includes:

passing said reactor effluent to a separator for separating said reactor effluent into a liquid fraction and a vapor fraction;

separating said liquid fraction into a liquid fraction portion of said liquid fraction and a liquid fraction remaining portion of said liquid fraction; and

using said liquid fraction portion of said liquid fraction as a first recycle stream of said recycle.

8. A process as recited in claim 7, wherein said step of separating said reactor effluent further includes:

passing said liquid fraction remaining portion of said liquid fraction to a fractionater for separating said liquid fraction remaining portion of said liquid fraction into a light cut and a heavy cut;

separating said heavy cut into a heavy cut portion of said heavy cut and a heavy cut remaining portion of said heavy cut; and

using said heavy cut portion of said heavy cut as a second recycle stream of said recycle.

9. A process as recited in claim 6, further comprising:

introducing said vapor fraction into said reactor along with said hydrocarbon stream and said recycle.

10. A process for the selective hydrogenation of monoolefins, diolefins, and sulfur compounds contained in a pyrolysis gasoline feedstock, wherein said pyrolysis gasoline feedstock having a monoolefins concentration, a diolefins concentration, an aromatics concentration, and an organic sulfur concentration, and wherein said process comprises:

introducing a hydrocarbon stream that comprises said pyrolysis gasoline feedstock into a reactor that contains a single hydrotreating reaction stage comprising hydrotreating catalyst and operated under selective hydrogenation conditions, wherein said hydrocarbon stream is contacted with said hydrotreating catalyst;

yielding from a reactor outlet of said reactor a reactor effluent having a reduced monoolefin concentration, a reduced diolefin concentration, a reduced organic sulfur concentration, and an aromatics content of at least 90 wt % of a reactor inlet aromatics content; and

introducing as a recycle a portion of said reactor effluent into said reactor wherein the weight ratio of said recycle to said hydrocarbon stream is greater than 1:1.

11. A process as recited in claim 10, wherein said monoolefins concentration is in the range of from 1 to 20 wt %, said diolefins concentration exceeds 3 wt %, said aromatics concentration is in the range of from 10 wt % to 80 wt %, and said organic sulphur concentration exceeds 50 ppmw, and wherein said reduced monoolefin concentration is measured by a bromine number of less than 1, said reduced diolefin concentration is less than 10 ppmw, and said reduced organic sulfur concentration is less than 3 ppmw.

12. A process as recited in claim 11, further comprising:

introducing into said reactor with said hydrocarbon stream a portion of said reactor effluent as a recycle at a rate so as to provide a weight ratio recycle-to-hydrocarbon stream that is greater than 1:1.

13. A process as recited in claim 12, wherein said selective hydrogenation conditions include a feed inlet temperature to said reactor that is in the range of from 100° C. to 250° C., a reactor operating pressure in the range of from 10 bara to 100 bara, and a weight hourly space velocity in the range of from 0.2 to 40 hr^{-1}.

14. A process as recited in claim 13, wherein said hydrotreating catalyst comprises molybdenum and either nickel or cobalt supported on alumina.