WHAT IS CLAIMED IS:

1. A method of removing unsaturated hydrocarbons in an aromatic fraction through selective hydrogenation, which comprises:

a) providing an aromatic hydrocarbon-containing feedstock having a bromine index of at least 30; and

b) bringing the feedstock into contact with a multi-stage catalyst bed comprising at least one first catalyst bed and a second catalyst bed disposed downstream of the first catalyst bed in a reactor and performing hydrogenation under supply of hydrogen to form an aromatic hydrocarbon-containing product having a reduced bromine index,

wherein,

the at least one first catalyst bed comprises a support containing inorganic oxide, and at least one active metal selected from the group consisting of Ni, Pd, Pt, Ru, Re, Co, Mo, Co-Mo, Ni-Mo, and Ni-W, in which, among the active metals, each of Re, Co, Mo, and Co-Mo is a reduced or sulfide form, and each of Ni, Pd, Pt, Ru, Ni-Mo and Ni-W is a sulfide form,

the second catalyst bed comprises a support containing inorganic oxide, and Ni-Mo and/or Ni-W in a reduced form as an active metal,

the at least one first catalyst bed exhibits a less activity for aromatic loss than the second catalyst bed, and

hydrogen supplied on the at least first catalyst bed is consumed as the hydrogenation proceeds such that hydrogen is supplied on the second catalyst bed in an amount lower than on the at least first catalyst bed.

2. A method of removing unsaturated hydrocarbons in an aromatic fraction through selective hydrogenation, which comprises:

a) providing an aromatic hydrocarbon-containing feedstock having a bromine index of at least 30; and

b) transferring the feedstock to a multi-stage hydrogenation unit comprising a first reaction unit containing at least one first catalyst and a second reaction unit containing a second catalyst and communicating with the first reaction unit at the downstream of the first reaction unit and performing hydrogenation under supply of hydrogen to form an aromatic hydrocarbon-containing product having a reduced bromine index,

wherein,

the at least one first catalyst comprises a support containing inorganic oxide, and at least one active metal

selected from the group consisting of Ni, Pd, Pt, Ru, Re, Co, Mo, Co-Mo, Ni-Mo, and Ni-W, in which, among the active metals, each of Re, Co, Mo, and Co-Mo is a reduced or sulfide form, and each of Ni, Pd, Pt, Ru, Ni-Mo and Ni-W is a sulfide form,

the second catalyst comprises a support containing inorganic oxide, and Ni-Mo and/or Ni-W in a reduced form as an active metal,

the at least one first catalyst exhibits a less activity for aromatic loss than the second catalyst, and

hydrogen supplied to the first reaction unit is consumed as the hydrogenation proceeds such that hydrogen is supplied to the second reaction unit in an amount lower than to the first reaction unit.

3. The method according to claim 1, wherein at least 30% by weight of unsaturated hydrocarbons in the aromatic hydrocarbon-containing feedstock is removed by hydrogenation.

4. The method according to claim 1, wherein an aromatic loss in the aromatic hydrocarbon-containing product is less than 1% by weight relative to the aromatic hydrocarbon-containing feedstock.

5. The method according to claim 2, wherein the first reaction unit comprises a plurality of reactors connected in series.

6. The method according to claim 1, wherein an amount of hydrogen supplied to the hydrogenation is within a range of at least 0.5 moles with respect to 1 mole of unsaturated hydrocarbons present in the feedstock.

7. The method according to claim 1, wherein a temperature of the hydrogenation is determined within a range from room temperature to 300°C, and

a pressure for the hydrogenation is determined within a range of 3 to 70 bar.

8. The method according to claim 1, wherein the inorganic oxide comprises at least one selected from the group consisting of alumina, silica, silica-alumina, aluminum phosphate, zirconia, titania, bentonite, kaolin, clinoptilolite and montmorillonite.

9. The method according to claim 1, wherein a content of the active metal in the first catalyst ranges from 0.5 to 40% by weight, and

a content of the active metal in the second catalyst ranges from 2 to 40% by weight.

10. The method according to claim 1, wherein the aromatic hydrocarbon-containing feedstock has a boiling point in a range of 35 to 300°C.

11. The method according to claim 1, wherein the aromatic hydrocarbon-containing feedstock is a C5+ reformate.

12. A system for separating and purifying aromatic hydrocarbons through selective hydrogenation, which comprises:

a feed line of an aromatic hydrocarbon-containing feedstock having a bromine index of at least 30;

a hydrogen feed line;

a hydrogenation reactor communicating with each of the feed line of the feedstock and the hydrogen feed line, the hydrogenation reactor filled with a multi-stage catalyst bed, in which the multi-stage catalyst bed comprises a first catalyst bed comprising at least one stage and at least one second catalyst bed disposed at the downstream of the first catalyst bed, along a flow

direction of the feedstock transferred through the feed line; and

at least one separator communicating with the hydrogenation reactor, the separator separating a product containing at least one aromatic hydrocarbon selected from the group consisting of C6 aromatics, C7 aromatics, C8 aromatics and C9+ aromatics, among products discharged from the hydrogenation reactor,

wherein,

the first catalyst bed comprises a support containing inorganic oxide, and at least one active metal selected from the group consisting of Ni, Pd, Pt, Ru, Re, Co, Mo, Co-Mo, Ni-Mo, and Ni-W, in which, among the active metals, each of Re, Co, Mo, and Co-Mo is a reduced or sulfide form, and each of Ni, Pd, Pt, Ru, Ni-Mo and Ni-W is a sulfide form,

the second catalyst bed comprises a support containing inorganic oxide, and Ni-Mo and/or Ni-W in a reduced form as an active metal,

the first catalyst bed exhibits a less activity for aromatic loss than the second catalyst bed, and

hydrogen supplied on the first catalyst bed is consumed as the hydrogenation proceeds such that hydrogen is supplied on the second catalyst bed in an amount lower than on the first catalyst bed.

13. A system for separating and purifying aromatic hydrocarbons through selective hydrogenation, which comprises:

a feed line of an aromatic hydrocarbon-containing feedstock having a bromine index of at least 30;

a hydrogen feed line;

a multi-stage hydrogenation unit communicating with each of the feed line of the feedstock and the hydrogen feed line, in which the multi-stage hydrogenation unit comprises a first reaction unit containing at least one first catalyst and a second reaction unit communicating with the first reaction unit at the downstream of the first reaction unit and containing a second catalyst, along a flow direction of the feedstock transferred through the feed line; and

at least one separator communicating with the multi-stage hydrogenation unit, the separator separating a product containing at least one aromatic hydrocarbon selected from the group consisting of C6 aromatics, C7 aromatics, C8 aromatics, and C9+ aromatics, among products discharged from the multi-stage hydrogenation unit,

wherein,

the first catalyst comprises a support containing inorganic oxide, and at least one active metal selected from the group consisting of Ni, Pd, Pt, Ru, Re, Co, Mo, Co-Mo, Ni-Mo, and Ni-W, in which, among the active metals, each of Re, Co, Mo, and Co-Mo is a reduced or sulfide form, and each of Ni, Pd, Pt, Ru, Ni-Mo and Ni-W is a sulfide form,

the second catalyst comprises a support containing inorganic oxide, and Ni-Mo and/or Ni-W in a reduced form as an active metal,

the at least one first catalyst exhibits a less activity for aromatic loss than the second catalyst, and

hydrogen supplied to the first reaction unit is consumed as the hydrogenation proceeds such that hydrogen is supplied to the second reaction unit in an amount lower than to the first reaction unit.

14. The system according to claim 12, further comprising a transalkylation unit for converting a fraction containing C6 aromatics, C7 aromatics and/or C9+ aromatics, among the aromatic hydrocarbon-containing product separated from the at least one separator, into C8 aromatics.

15. The system according to claim 14, further comprising a recycling line for recycling unrecovered C8 aromatics after separating and recovering para-xylene from the C8 aromatic hydrocarbon-containing product.

16. The system according to claim 12, further comprising a para-xylene separation and/or recovery unit for separating and/or recovering para-xylene from the C8 aromatics among the aromatic hydrocarbon-containing product separated from the at least one separator; and

a xylene isomerization unit for isomerizing unseparated/unrecovered C8 aromatics, other than the para-xylene to form an increased content of para-xylene.

17. The system according to claim 16, further comprising a recycling line for recycling the remaining xylene fraction after separating and/or recovering para-xylene among the aromatic fraction discharged from the xylene isomerization unit.