Claims

1. A method for hydroprocessing reformate, comprising contacting reformate with a catalyst having a catalytic hydrogenation action under a liquid-phase hydroprocessing condition in a hydrogenation reactor, at least part of hydrogen gas for hydroprocessing is from dissolved hydrogen contained in the reformate;

wherein the hydroprocessing is carried out in presence of supplemental hydrogen gas, the supplemental hydrogen gas is hydrogen gas injected into the reformate in one time or in several times before contacting and/or during contacting, the supplemental hydrogen gas is injected into the reformate through pores having an average pore diameter in a range of 30 nm to 1,000 nm, the supplemental hydrogen gas is injected in an amount for 0.01 to 4 times of saturated solubility of the hydrogen gas in the reformate, the saturated solubility is a saturated solubility measured under the liquid-phase hydroprocessing condition; and

wherein the liquid-phase hydroprocessing condition comprises a temperature in a range of 130 °C to 200 °C and a pressure by gauge pressure in a range of 1.5 MPa to 3.5 MPa.

2. The method according to claim 1, wherein the supplemental hydrogen gas is injected into the reformate through the pores by means of a mixing device, the mixing device comprises at least one liquid passage for accommodating the reformate and at least one gas passage for accommodating the supplemental hydrogen gas, the liquid passage is adjacent to the gas passage through a component, at least part of the component is a porous area having the pores with an average pore diameter in a range of 30 nm to 1,000 nm, the supplemental hydrogen gas is injected into the reformate through the pores.

3. The method according to claim 1 or 2, wherein, the supplemental hydrogen gas is injected in an amount for 0.01 to 2 times of the saturated solubility, the supplemental hydrogen gas is preferably injected in an amount for 0.1 times to less than 1 time of the saturated solubility.

4. The method according to claim 1, wherein, further comprising removing light constituents in product obtained by contacting, to obtain light constituent-removed oil, reformate is fed into the hydrogenation reactor after exchanging heat with the light constituent-removed oil.

5. The method according to claim 1 or 4, wherein, the hydrogenation reactor is a tubular reactor, the hydrogenation reactor is preferably a tubular fixed-bed hydrogenation reactor.

6. The method according to claim 5, wherein, the reformate has a volume space velocity in a range of 5 h^{-1} to 20 h^{-1}.

7. The method according to any one of claims 1 to 4, wherein, the reformate is obtained from bottom of gas liquid separating tank by injecting a catalytic reforming mixture into the gas liquid separating tank, the catalytic reforming mixture is obtained by contacting hydrocarbon oil with a catalyst having a reforming catalytic action under a catalytic reforming condition.

8. The method according to claim 1, wherein, contacting the reformate with the catalyst is without using diluent and circulating oil.

9. An apparatus for processing reformate, comprising

catalytic reforming reactor (5), for contacting hydrocarbon oil with a catalyst having a reforming catalytic action under a condition of catalytic reforming, to obtain a catalytic reforming mixture;

gas liquid separating tank (6), for removing volatile constituents (7) from catalytic reforming mixture by gas liquid separation, to obtain reformate from the bottom of the gas liquid separating tank (6);

mixing device (8), for injecting supplemental hydrogen gas into the reformate, to obtain hydrogen-containing reformate, wherein the mixing device (8) comprises at least one liquid passage (1) for accommodating the reformate and at least one gas passage (2) for accommodating the supplemental hydrogen gas, the liquid passage (1) is adjacent to the gas passage (2) through a component (3), at least part of the component (3) is a porous area having the pores with an average pore diameter in a range of 30 nm to 1,000 nm; the inner wall of the component (3) forms the liquid passage (1), the outer wall of the component (3) and inner wall of a housing (22) form the gas passage (2), the two ends of the gas passage (2) are sealed, and the housing (22) has an opening for connecting with a source of hydrogen gas;

hydrogenation reactor (9), for contacting the hydrogen-containing reformate with a catalyst having a catalytic hydrogenation action under a liquid-phase hydroprocessing condition, wherein the hydrogenation reactor is a tubular reactor;

the mixing device (8) is connected to an inlet line (18) of the tubular reactor (9);

light constituent removing tower (10), for removing light constituents (12), so as to obtain light constituent-removed oil from bottom of the light constituent removing tower (10);

heat exchanger (11), for making the light constituent-removed oil exchange heat with reformate before the reformate is injected into the mixing device (8);

heavy constituent removing tower (13), for separating heavy constituent from the

light constituent-removed oil after exchange heat, so as to obtain heavy constituents (15) from bottom of the heavy constituent removing tower (13) and a raw material (14) for aromatics extraction at the top of tower.

10. The apparatus according to claim 9, without using diluent and circulating oil in the hydrogenation reactor (9).