What is claimed is:

1. A method for producing feed stock of ethylene steam cracker and a nano-carbon material from waste plastics, comprising the following steps:

(1) subjecting a waste plastic to thermal pyrolysis to obtain hydrocarbon oil and gas from thermal pyrolysis;

(2) subjecting the hydrocarbon oil and gas from thermal pyrolysis obtained in step (1) to gas-liquid separation to obtain crude plastic pyrolysis oil and pyrolysis gas;

(3) subjecting the pyrolysis gas obtained in step (2) to decarbonization to obtain the nano-carbon material and hydrogen, and subjecting the hydrogen to purification and then using in hydrocracking in step (4);

(4) subjecting the crude plastic pyrolysis oil obtained in step (2) to hydrocracking to obtain hydrotreated plastic pyrolysis oil; and

(5) fractionating the hydrotreated plastic pyrolysis oil obtained in step (4) to obtain the feed stock of ethylene steam cracker;

the decarbonization in step (3) adopts a high-temperature thermal pyrolysis technology;

the decarbonization is performed at a temperature of 1500-3500 °C;

the decarbonization is performed at a pressure of 0.5-5 MPa;

a heavy component and mixed hydrocarbon gas are also obtained after the fractionating in step (5);

the heavy component is used back for the hydrocracking in step (4);

the mixed hydrocarbon gas is used back for the decarbonization in step (3).

2. The method according to claim 1, wherein the waste plastic in step (1) comprises polyethylene and/or polypropylene.

3. The method according to claim 1, wherein the waste plastic is subjected to a pretreatment before the thermal pyrolysis.

4. The method according to claim 3, wherein a method of the pretreatment comprises any one or a combination of at least two of magnetic separation, infrared separation, or density separation.

5. The method according to claim 1, wherein the thermal pyrolysis is performed at a temperature of 400-550 °C.

6. The method according to claim 1, wherein the pyrolysis gas in step (2) comprises hydrogen and non-condensable hydrocarbon gas.

7. The method according to claim 6, wherein the non-condensable hydrocarbon gas comprises C1-C4 gaseous hydrocarbon.

8. The method according to claim 1, wherein the purification comprises pressure swing adsorption or membrane separation.

9. The method according to claim 1, wherein the hydrocracking in step (4) is performed at a temperature of 300-400 °C.

10. The method according to claim 1, wherein the hydrocracking is performed at a pressure of 3-15 MPa.

11. The method according to claim 1, wherein a fraction range of the heavy component is 350-550 °C.

12. The method according to claim 1, wherein the mixed hydrocarbon gas comprises C1-C4 gaseous hydrocarbon.

13. The method according to claim 1, wherein a fraction range of the feed stock of ethylene steam cracker is 65-400 °C.

14. The method according to claim 1, comprising the following steps:

(1) subjecting a waste plastic to a pretreatment, where a method of the pretreatment comprises any one or a combination of at least two of magnetic separation, infrared separation, or density separation, and then performing thermal pyrolysis at a temperature of 400-550 °C to obtain hydrocarbon oil and gas from thermal pyrolysis;

(2) subjecting the hydrocarbon oil and gas from thermal pyrolysis obtained in step (1) to gas-liquid separation to obtain crude plastic pyrolysis oil and pyrolysis gas;

(3) subjecting the pyrolysis gas obtained in step (2) to decarbonization by a high-temperature thermal pyrolysis technology at a temperature of 1500-3500 °C and a pressure of 0.5-5 MPa to obtain the nano-carbon material and hydrogen, and subjecting the hydrogen to pressure swing adsorption or membrane separation and then using in hydrocracking in step (4);

(4) subjecting the crude plastic pyrolysis oil obtained in step (2) to hydrocracking at a temperature of 300-400 °C and a pressure of 3-15 MPa to obtain hydrotreated plastic pyrolysis oil; and

(5) fractionating the hydrotreated plastic pyrolysis oil obtained in step (4) to obtain the feed

stock of ethylene steam cracker, a heavy component, and mixed hydrocarbon gas, where a fraction range of the feed stock of ethylene steam cracker is 65-400 °C, a fraction range of the heavy component is 350-550 °C, the mixed hydrocarbon gas comprises C1-C4 gaseous hydrocarbon, the heavy component is used back for the hydrocracking in step (4), and the mixed hydrocarbon gas is used back for the decarbonization in step (3).

15. A device system for producing feed stock of ethylene steam cracker and a nano-carbon material from waste plastics, which is used for the method for producing feed stock of ethylene steam cracker and a nano-carbon material from waste plastics according to any one of claims 1-14;

the device system comprises a thermal pyrolysis unit, a gas-liquid separation unit, a hydrocracking unit, and a fractionating unit which are connected in sequence; the device system further comprises a decarbonization unit;

an outlet of the thermal pyrolysis unit is connected to an inlet of the gas-liquid separation unit;

a liquid-phase outlet of the gas-liquid separation unit is connected to an inlet of the hydrocracking unit;

an outlet of the hydrocracking unit is connected to an inlet of the fractionating unit;

a heavy-component outlet of the fractionating unit is connected to the inlet of the hydrocracking unit;

a gas-phase outlet of the fractionating unit is connected to an inlet of the decarbonization unit;

a gas-phase outlet of the gas-liquid separation unit is connected to the inlet of the decarbonization unit.

16. The device system according to claim 15, wherein the device system further comprises a pretreatment unit; an outlet of the pretreatment unit is connected to an inlet of the thermal pyrolysis unit.

17. The device system according to claim 15, wherein a gas-phase outlet of the decarbonization unit is connected to the inlet of the hydrocracking unit.