What is claimed is:

1. A heterojunction solar cell film deposition apparatus configured to deposit an amorphous silicon-based film of a heterojunction solar cell and comprising a process chamber, wherein the process chamber comprises:
at least two intrinsic process chambers configured to deposit an intrinsic layer silicon film;
at least one doping process chamber configured to deposit an N-type silicon film or a P-type silicon film;
wherein the chambers are isolated by isolation valves, the chambers of the film deposition apparatus are linearly arranged in an order of a loading chamber, a preheating chamber, the at least two intrinsic process chambers, the at least one doping process chamber, and an unloading chamber, a pressure difference between the process chambers of the same type is less than 20%;
wherein the preheating chamber is configured to heat a carrier plate loaded with a solar cell wafer to be processed and adjust gas and pressure atmosphere.

2. The heterojunction solar cell film deposition apparatus according to claim 1, further comprising a return mechanism, wherein the return mechanism sends the carrier plate back to a feeding station using a roller or a belt structure, wherein the unloading chamber comprises an unloading buffer chamber and a discharging unloading chamber.

3. The heterojunction solar cell film deposition apparatus according to claim 1, wherein in a direction of a processing sequence, a proportion of hydrogen in a latter intrinsic process chamber is higher than or equal to a proportion of hydrogen in a former intrinsic process chamber.

4. The heterojunction solar cell film deposition apparatus according to claim 1, wherein the

intrinsic process chamber and the doping process chamber are provided with a capacitance-coupling flat plate structure configured to form the film by chemical vapor deposition, a flat plate capacitance distance between the capacitance-coupling flat plate in the process chamber and the carrier plate loaded with the solar cell wafer to be processed is 5mm to 60mm.

5. The heterojunction solar cell film deposition apparatus according to claim 1, wherein one or more process chambers are provided with an independent heating module therein configured to adjust a working temperature of the chambers to be within 100ºC to 400ºC.

6. The heterojunction solar cell film deposition apparatus according to any one of claims 1 to 5, wherein the film deposition apparatus is provided with the carrier plate configured to load the solar cell wafer to be processed, the carrier plate is transferred by a roller mechanism, a transmission speed of a roller is 100mm/s to 800mm/s.

7. The heterojunction solar cell film deposition apparatus according to claim 6, wherein an upper surface of the carrier plate is coated with an insulating coating.

8. The heterojunction solar cell film deposition apparatus according to claim 6, wherein a lower surface of the carrier plate is coated with a conductive coating.

9. The heterojunction solar cell film deposition apparatus according to claim 6, wherein the carrier plate is a composite structure comprising a base plate and a support unit.

10. The heterojunction solar cell film deposition apparatus according to claim 6, wherein the preheating chamber heat the carrier plate and the loaded solar cell wafer on the carrier plate by a non-contact heating method.

11. The heterojunction solar cell film deposition apparatus according to any one of claims 1 to 5, wherein the intrinsic process chamber and the doping process chamber are connected to corresponding vacuum pumps configured to evacuate the chambers, the chambers of the same type share one vacuum pump.

12. The heterojunction solar cell film deposition apparatus according to any one of claims 1 to 5, wherein two to six intrinsic process chambers are provided, and one to four doping process chambers are provided.

13. The heterojunction solar cell film deposition apparatus according to claim 12, comprising the loading chamber, the preheating chamber, two intrinsic process chambers, one doping process chamber, and the unloading chamber that are linearly arranged in sequence from front to back; or

comprising the loading chamber, the preheating chamber, three intrinsic process chambers, one doping process chamber, and the unloading chamber that are linearly arranged in sequence from front to back; or

comprising the loading chamber, the preheating chamber, three intrinsic process chambers, two doping process chambers, and the unloading chamber that are linearly arranged in sequence from front to back; or

comprising the loading chamber, the preheating chamber, four intrinsic process chambers, two doping process chambers, and the unloading chamber that are linearly arranged in sequence from front to back; or

comprising the loading chamber, the preheating chamber, four intrinsic process chambers, two doping process chambers, the unloading buffer chamber, and the unloading chamber that are linearly arranged in sequence from front to back; or

comprising the loading chamber, the preheating chamber, five intrinsic process chambers, three

doping process chambers, the unloading buffer chamber, and the discharging unloading chamber that are linearly arranged in sequence from front to back.

14. The heterojunction solar cell film deposition apparatus according to claim 1, wherein an isolation chamber is provided between the intrinsic process chamber and the doping process chamber, and the chambers are isolated by isolation valves.

15. The heterojunction solar cell film deposition apparatus according to claim 14, comprising the loading chamber, the preheating chamber, three intrinsic process chambers, the isolation chamber, the doping process chamber, and the unloading chamber that are linearly arranged in sequence from front to back; or

comprising the loading chamber, the preheating chamber, three intrinsic process chambers, the isolation chamber, two doping process chambers, and the unloading chamber that are linearly arranged in sequence from front to back; or

comprising the loading chamber, the preheating chamber, four intrinsic process chambers, the isolation chamber, two doping process chambers, and the unloading chamber that are linearly arranged in sequence from front to back; or

comprising the loading chamber, the preheating chamber, four intrinsic process chambers, the isolation chamber, two doping process chambers, an unloading buffer chamber, and a discharging unloading chamber that are linearly arranged in sequence from front to back; or

comprising the loading chamber, the preheating chamber, five intrinsic process chambers, the isolation chamber, three doping process chambers, an unloading buffer chamber, and a discharging unloading chamber that are linearly arranged in sequence from front to back; or

comprising the loading chamber, the preheating chamber, six intrinsic process chambers, the isolation chamber, four doping process chambers, an unloading buffer chamber, and a discharging unloading chamber that are linearly arranged in sequence from front to back.

16. A method for producing a heterojunction solar cell using the film deposition apparatus according to any one of claims 1 to 15, wherein:
after the loading chamber is fed, the carrier plate is heated through the heating preheating chamber, then the gas and pressure atmosphere are adjusted in the preheating buffer chamber, then the carrier plate is sent to the intrinsic process chamber, and the film deposition processing of the intrinsic layer silicon film is completed in steps in at least two intrinsic process chambers, and then the carrier plate is sent to the doping process chamber, and the deposition of N-type silicon film or P-type silicon film is completed through at least one doping process chamber, when the doping process chamber is working, the intrinsic process chamber is in a waiting state or deposit and coat the heterojunction solar cell wafer on another carrier plate.

17. The method for film deposition the heterojunction solar cell according to claim 16, wherein the carrier plate is transferred synchronously though a roller mechanism, when the carrier plate is transferred between adjacent process chambers, the isolation valve between the chambers is opened, and process gas is constantly introduced into the chambers.

18. The method for film deposition the heterojunction solar cell according to any one of claims 16 or 17, comprising:
S1, the carrier plate is fed in the loading chamber;
S2, the carrier plate is preheated by non-contact heating in the heating preheating chamber to reach a temperature required by the process, then go to the preheating buffer chamber to adjust the gas and pressure atmosphere in the chamber so that the carrier plate directly enters the intrinsic process chamber;
S3, film deposition processing is performed in the first intrinsic process chamber, a film deposition is performed on the capacitance-coupling flat plate structure based on chemical

vapor deposition method in the process chamber, and after the processing is completed, the carrier plate enters next intrinsic process chamber to continue film deposition processing;

S4, the processing of the intrinsic layer silicon film is completed in the intrinsic process chamber, and then the carrier plate enters the doping process chamber to perform the deposition process of the N-type silicon film or the P-type silicon film;

S5, after step S4 is completed, the carrier plate is unloaded through the unloading chamber; and

S6, the rollers of the return mechanism return the carrier plate to the loading chamber, and the carrier plate is kept warm during the process.

19. A heterojunction solar cell film deposition system comprising at least two heterojunction solar cell film deposition apparatus according to any one of claims 1 to 15, wherein one of the heterojunction solar cell film deposition apparatus is configured to deposit and coat the intrinsic layer silicon film and N-type silicon film on one side of the solar cell wafer, another one of the heterojunction solar cell film deposition apparatus is configured to deposit the intrinsic layer silicon film and P-type silicon film on the other side of the solar cell wafer.

20. A heterojunction solar cell, wherein the heterojunction solar cell film deposition apparatus according to any one of claims 1 to 15 is configured to perform silicon film deposition process, so as to form the solar cell.

21. A heterojunction solar module comprising a plurality of the heterojunction solar cells of claim 20 connected in series.

22. A photovoltaic power generation system comprising the solar module of claim 21.

23. The heterojunction solar cell film deposition apparatus according to claim 1, wherein the preheating chamber comprises:

a heating preheating chamber configured to heat a carrier plate loaded with a solar cell wafer to be processed; and

a preheating buffer chamber located between the heating preheating chamber and the intrinsic process chamber and configured to adjust gas and pressure atmosphere.