US 20120244784A1

(19) **United States**

(12) **Patent Application Publication**

Yang et al.

(10) **Pub. No.: US 2012/0244784 A1**

(43) **Pub. Date: Sep. 27, 2012**

(54) **CHEMICAL-MECHANICAL POLISHING TOOL AND METHOD FOR PREHEATING THE SAME**

(75) Inventors: **Tao Yang**, Beijing (CN); **Chao Zhao**, Kessek-lo (BE); **Junfeng Li**, Beijing (CN)

(73) Assignee: **INSTITUTE OF MICROELECTRONICS, CHINESE ACADEMY OF SCIENCES**, Beijing (CN)

(21) Appl. No.: **13/142,714**

(22) PCT Filed: **Apr. 11, 2011**

(86) PCT No.: **PCT/CN2011/072587**

§ 371 (c)(1), (2), (4) Date: **Jun. 29, 2011**

(30) **Foreign Application Priority Data**

Dec. 21, 2010 (CN) 201010599278.7

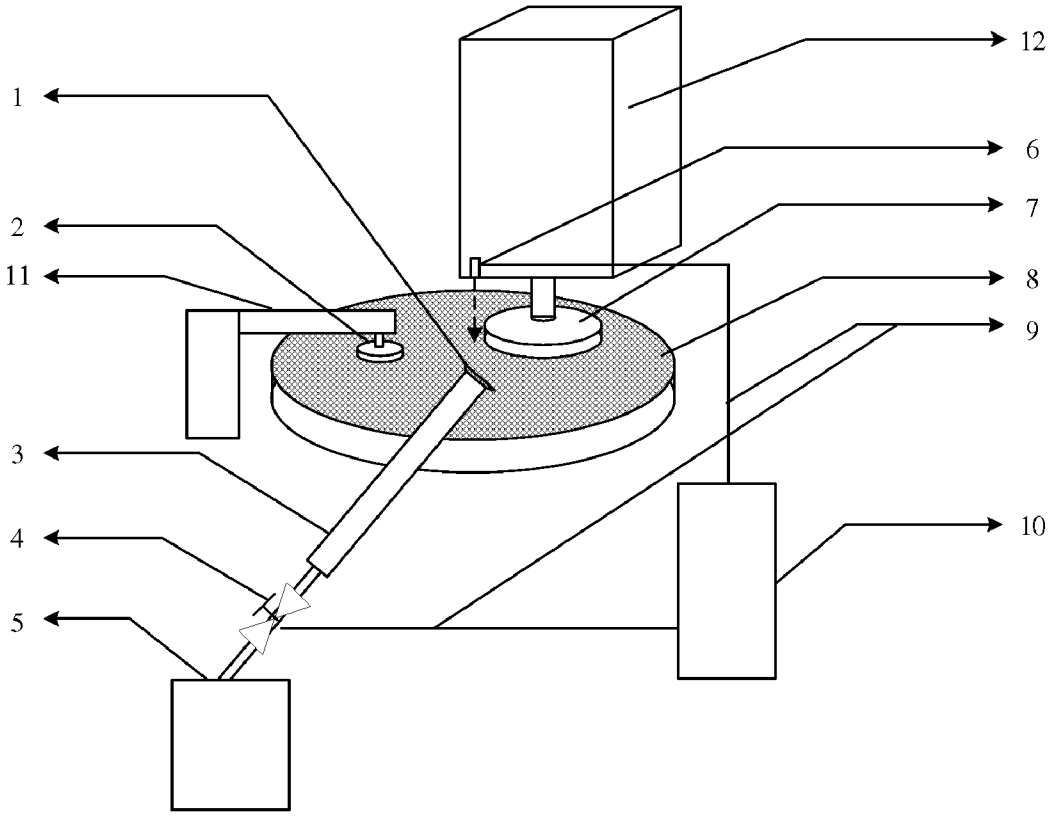
Publication Classification

(51) **Int. Cl.**
B24B 53/017 (2012.01)
B24B 1/00 (2006.01)

(52) **U.S. Cl.** **451/1**; 451/53

(57) **ABSTRACT**

A chemical-mechanical polishing tool and a method for preheating the same are disclosed. The chemical-mechanical polishing tool includes: a polishing pad, a deionized water supply channel, a polishing slurry supply channel and a polishing pad conditioner; and the chemical-mechanical polishing tool further includes: a heating apparatus, adapted to heat DI water fed to the DI water supply channel; a temperature sensor, arranged close to the polishing pad to measure a temperature of the polishing pad; and a preheating control system, connected to the temperature sensor, and adapted to control the DI water supply channel to spray the heated DI water to the polishing pad, and when the temperature measured by the temperature sensor is equal to or higher than a predetermined temperature, to close the DI water supply channel, control the polishing slurry supply channel to spray polishing slurry to the polishing pad, and startup the polishing pad conditioner to dress the polishing pad. The invention can reduce the consumption of polishing consumables by the chemical-mechanical polishing tool during preheating, thereby reducing production cost.



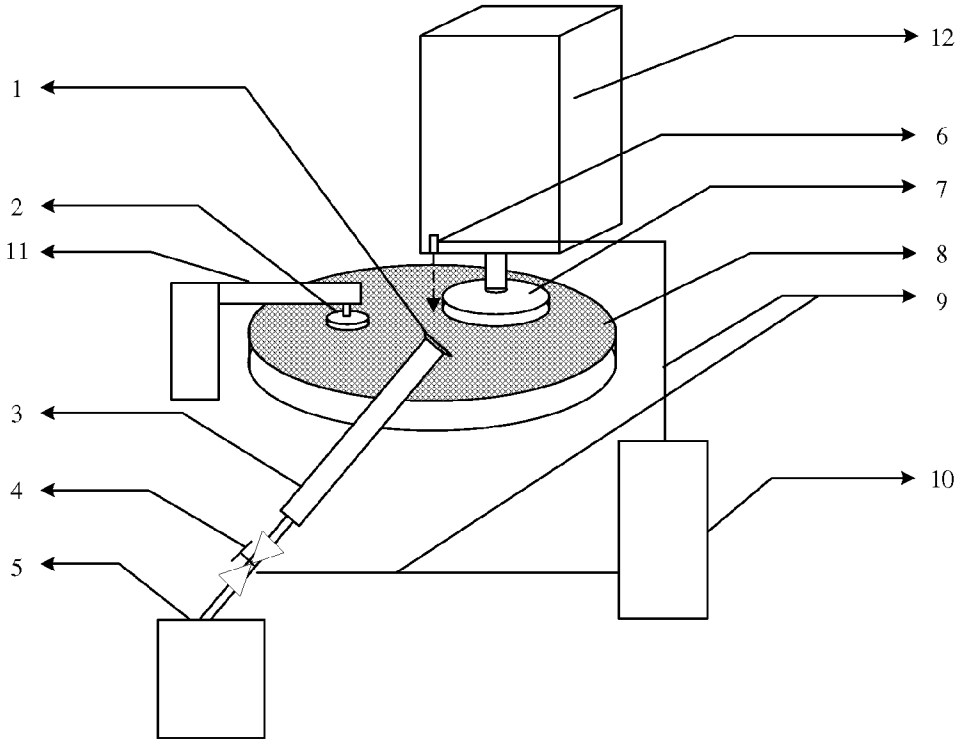


FIG. 1

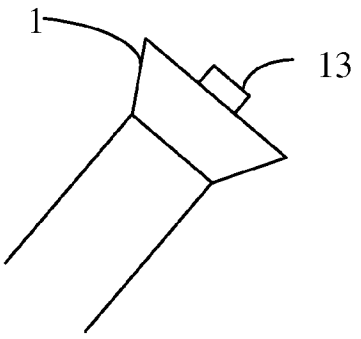


FIG. 2

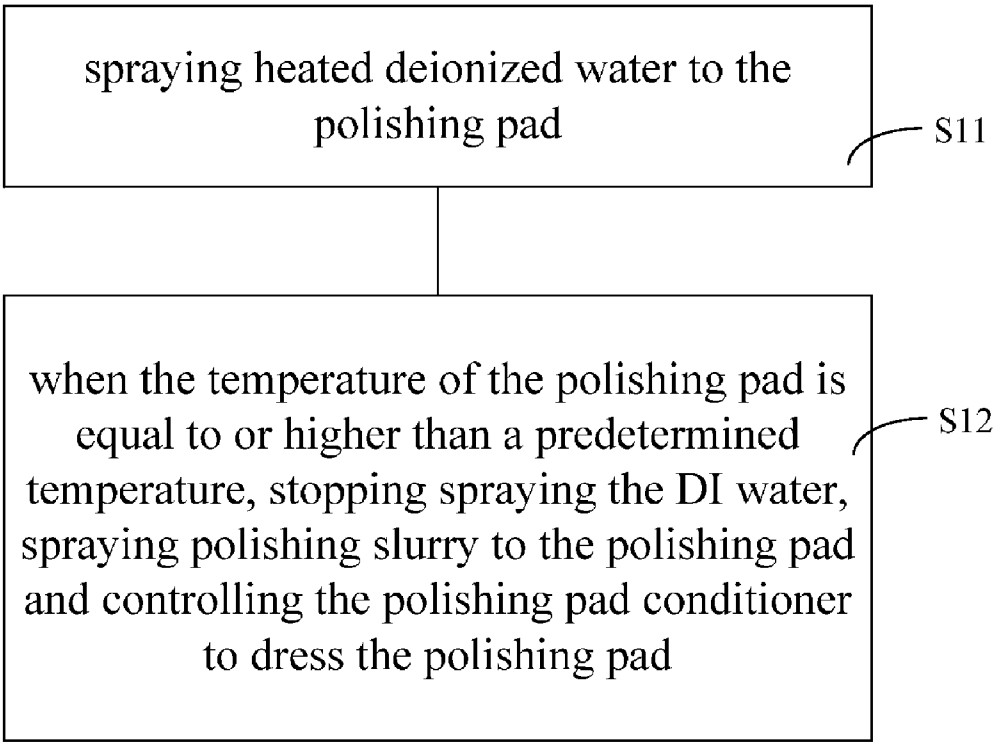

spraying heated deionized water to the polishing pad
S11
when the temperature of the polishing pad is equal to or higher than a predetermined temperature, stopping spraying the DI water, spraying polishing slurry to the polishing pad and controlling the polishing pad conditioner to dress the polishing pad
S12

FIG. 3

CHEMICAL-MECHANICAL POLISHING TOOL AND METHOD FOR PREHEATING THE SAME

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to Chinese patent application 201010599278.7 titled "CHEMICAL-MECHANICAL POLISHING TOOL AND METHOD FOR PREHEATING THE SAME" and filed with the State Intellectual Property Office on Dec. 21, 2010, the content of which is incorporated herein by reference in is entirety.

FIELD OF THE INVENTION

[0002] The present invention relates to the field of semiconductor tools, and particularly to a chemical-mechanical polishing tool and a method for preheating the same.

BACKGROUND OF THE INVENTION

[0003] Chemical-Mechanical Polishing (CMP) is a process of planarization. Since its adoption in the integrated circuit industry in 1990, through continuous practice and improvement, CMP has become a key to reducing the technology node of integrated circuits. Nowadays, CMP is widely used in the planarization of shallow trench isolation (STI), oxides, tungsten plugs, copper metallization, etc. In the process of CMP, every time before the polishing of product wafers, dummy wafers of a variety of types are polished on the polishing pad. A main purpose of this is to preheat the CMP tool, so that the temperature and condition of the polishing pad can be more stable, thereby ensuring the stability of the CMP process for product wafers.

[0004] In the prior art, depending on the number of polishing heads in a CMP tool, at least 4 or 8 dummy wafers, or more, are polished on each polishing pad, to raise the temperature of the polishing pad to a proper range, and bring the surface of the polishing pad into an operating condition. In a practical CMP process of chip fabrication, if a CMP tool has been idle for more than half an hour, generally, it should be preheated before starting to planarize product wafers. It is known that CMP is a high-cost process in the whole procedure of integrated circuit manufacturing, because of its consumption of polishing consumables during planarization, including polishing pads, polishing slurry and polishing pad conditioners. Hence, preheating of a CMP tool consumes dummy wafers and polishing slurry, and reduces the service life of the polishing pad and the polishing pad conditioner, which inevitably will all be reflected on the cost of product wafers; this is one of the main reasons that CMP is costly.

SUMMARY OF THE INVENTION

[0005] A problem to be solved by the present invention is that the conventional method for preheating a chemical-mechanical polishing tool has very high consumption of polishing consumables and thereby increases production cost.

[0006] To solve the problem above, the present invention provides a chemical-mechanical polishing tool, including: a polishing pad, a deionized (DI) water supply channel, a polishing slurry supply channel and a polishing pad conditioner, wherein the chemical-mechanical polishing tool further includes:

[0007] a heating apparatus, adapted to heat DI water fed to the DI water supply channel;

[0008] a temperature sensor, arranged close to the polishing pad to measure a temperature of the polishing pad; and

[0009] a preheating control system, connected to the temperature sensor, and adapted to control the DI water supply channel to spray the heated DI water to the polishing pad, and when the temperature measured by the temperature sensor is equal to or higher than a predetermined temperature, to close the DI water supply channel, control the polishing slurry supply channel to spray polishing slurry to the polishing pad, and startup the polishing pad conditioner to dress the polishing pad.

[0010] Optionally, the heating apparatus is adapted to heat the DI water to a temperature ranging from room temperature to 60° C.

[0011] Optionally, a nozzle is arranged at an end of the DI water supply channel, and a baffle is arranged at an outlet of the nozzle.

[0012] Optionally, the predetermined temperature ranges from room temperature to 60° C.

[0013] Optionally, the preheating control system is adapted to control the polishing pad conditioner to dress the polishing pad for 20 s to 60 s.

[0014] Optionally, the length of the polishing pad conditioner in a radial direction of the polishing pad is equal to or larger than a radius of the polishing pad.

[0015] Optionally, the length of the polishing pad conditioner in a radial direction of the polishing pad is smaller than a radius of the polishing pad.

[0016] Optionally, the preheating control system is adapted to control the polishing pad conditioner to move in a radial direction of the polishing pad, to realize dressing of the polishing pad.

[0017] Optionally, the preheating control system is adapted to control the polishing pad conditioner to move in a radial direction of the polishing pad at a constant speed or a variable speed.

[0018] Optionally, an electrically-controlled valve is arranged in the DI water supply channel and the polishing slurry supply channel, and the electrically-controlled valve is connected with the preheating control system and controlled by it.

[0019] The present invention also provides a method for preheating a chemical-mechanical polishing tool, the chemical-mechanical polishing tool including a polishing pad and a polishing pad conditioner, wherein the method includes:

[0020] spraying heated DI water to the polishing pad; and

[0021] when a temperature of the polishing pad is equal to or higher than a predetermined temperature, stopping spraying the DI water, spraying polishing slurry to the polishing pad and controlling the polishing pad conditioner to dress the polishing pad.

[0022] Optionally, the heated DI water has a temperature ranging from room temperature to 60° C.

[0023] Optionally, the predetermined temperature ranges from room temperature to 60° C.

[0024] Optionally, the time of the polishing pad conditioner dressing the polishing pad ranges from 20 s to 60 s.

[0025] Optionally, the length of the polishing pad conditioner in a radial direction of the polishing pad is equal to or larger than a radius of the polishing pad, and the polishing pad conditioner dressing the polishing pad includes: pressing the polishing pad conditioner on the polishing pad, and driving the polishing pad to rotate.

[0026] Optionally, the length of the polishing pad conditioner in a radial direction of the polishing pad is smaller than a radius of the polishing pad, and the polishing pad conditioner dressing the polishing pad includes: pressing the polishing pad conditioner on the polishing pad, driving the polishing pad to rotate, and driving the polishing pad conditioner to move in a radial direction of the polishing pad.

[0027] Optionally, the polishing pad conditioner moves in a radial direction of the polishing pad at a constant speed or a variable speed.

[0028] Compared with the prior art, the technical solution of the present invention has the following advantages.

[0029] The chemical-mechanical polishing tool of the technical solution includes: a polishing pad, a DI water supply channel, a polishing slurry supply channel and a polishing pad conditioner; and the chemical-mechanical polishing tool further includes: a heating apparatus, adapted to heat DI water fed to the DI water supply channel; a temperature sensor, arranged close to the polishing pad to measure a temperature of the polishing pad; and a preheating control system, connected to the temperature sensor, and adapted to control the DI water supply channel to spray the heated DI water to the polishing pad, and when the temperature measured by the temperature sensor is equal to or higher than a predetermined temperature, to close the DI water supply channel, control the polishing slurry supply channel to spray polishing slurry to the polishing pad, and startup the polishing pad conditioner to dress the polishing pad. The chemical-mechanical polishing tool above performs preheating by using the heated DI water and the polishing pad conditioner dressing the polishing pad. Dummy wafers are no longer needed, and consumption of polishing consumables including polishing slurry and the polishing pad is reduced, thereby reducing production cost.

[0030] Furthermore, the chemical-mechanical polishing tool of the technical solution has a nozzle arranged at an end of the DI water supply channel and a baffle arranged at an outlet of the nozzle, so that the spray range for the DI water can be increased, thereby improving preheating performance.

[0031] The method for preheating a chemical-mechanical polishing tool of the technical solution includes: firstly, spraying heated DI water to the polishing pad; and when a temperature of the polishing pad is equal to or higher than a predetermined temperature, stopping spraying the DI water, spraying polishing slurry to the polishing pad and controlling the polishing pad conditioner to dress the polishing pad. The method above firstly heats the polishing pad using the heated DI water, then dresses the polishing pad by the polishing pad conditioner so that the polishing pad quickly reaches its operating condition. Dummy wafers are no longer needed, and consumption of polishing consumables including polishing slurry and the polishing pad is reduced, thereby reducing production cost.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] FIG. **1** is a structural diagram of a chemical-mechanical polishing tool according to an embodiment of the present invention;

[0033] FIG. **2** is a locally enlarged diagram illustrating a nozzle of the chemical-mechanical polishing tool shown in FIG. **1**; and

[0034] FIG. **3** is a flow chart of a method for preheating a chemical-mechanical polishing tool according to the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0035] In the prior art, preheating of a chemical-mechanical polishing tool is performed by polishing plural dummy wafers, which has very high consumption of e.g. dummy wafers and polishing slurry, and may reduce the service life of the polishing pad and the polishing pad conditioner, and increase production cost.

[0036] The chemical-mechanical polishing tool of the technical solution includes: a polishing pad, a deionized (DI) water supply channel, a polishing slurry supply channel and a polishing pad conditioner; and the chemical-mechanical polishing tool further includes: a heating apparatus, adapted to heat DI water fed to the DI water supply channel; a temperature sensor, arranged close to the polishing pad to measure a temperature of the polishing pad; and a preheating control system, connected to the temperature sensor, and adapted to control the DI water supply channel to spray the heated DI water to the polishing pad, and when the temperature measured by the temperature sensor is equal to or higher than a predetermined temperature, to close the DI water supply channel, control the polishing slurry supply channel to spray polishing slurry to the polishing pad, and startup the polishing pad conditioner to dress the polishing pad. The chemical-mechanical polishing tool above performs preheating by using the heated DI water and the polishing pad conditioner dressing the polishing pad. Dummy wafers are no longer needed, and consumption of polishing consumables including polishing slurry and the polishing pad is reduced, thereby reducing production cost.

[0037] Furthermore, the chemical-mechanical polishing tool of the technical solution has a nozzle arranged at an end of the DI water supply channel and a baffle arranged at an outlet of the nozzle, so that the spray range for the DI water can be increased, thereby improving preheating performance.

[0038] The method for preheating a chemical-mechanical polishing tool of the technical solution includes: firstly, spraying heated DI water to the polishing pad; and when a temperature of the polishing pad is equal to or higher than a predetermined temperature, stopping spraying the DI water, spraying polishing slurry to the polishing pad and controlling the polishing pad conditioner to dress the polishing pad. The method above firstly heats the polishing pad using the heated DI water, then dresses the polishing pad by the polishing pad conditioner so that the polishing pad quickly reaches its operating condition. Dummy wafers are no longer needed, and consumption of polishing consumables including polishing slurry and the polishing pad is reduced, thereby reducing production cost.

[0039] For better understanding of the objective, features and advantages of the present invention, the embodiments of the present invention will be described hereinafter in details with reference to the accompanying drawings.

[0040] Specific details are described herein for illustrative purposes only. It should be noted that, the present invention can be implemented in many ways other than what is described herein, and those skilled in the art can make modifications without departing from the scope of the present invention. Therefore, the present invention is not limited to the embodiments disclosed herein.

[0041] FIG. **1** shows a structural diagram of a chemical-mechanical polishing tool according to an embodiment of the present invention, which includes: a polishing pad **8**, a polishing head **7**, a polishing pad conditioner **2**, a DI water supply channel, a polishing slurry supply channel, a heating apparatus **5**, a temperature sensor **6** and a preheating control system **10**.

[0042] The polishing pad **8** may be arranged on a polishing plate (not shown), and rotate as driven by the rotation of the polishing plate.

[0043] The DI water supply channel and the polishing slurry supply channel are arranged on a beam **3** for DI water and polishing slurry supply. For clarity purposes, the DI water supply channel and the polishing slurry supply channel are not shown in FIG. **1**. An electrically-controlled valve **4** is arranged in the DI water supply channel and the polishing slurry supply channel, and a nozzle **1** is arranged at an end of the DI water supply channel. By switching between states, the electrically-controlled valve **4** can control the DI water supply channel or the polishing slurry supply channel on the beam **3** to spray DI water or polishing slurry, or, completely close the DI water supply channel and the polishing slurry supply channel so that the DI water or the polishing slurry is not sprayed.

[0044] With reference to FIG. **2**, a locally enlarged diagram illustrating a nozzle of the chemical-mechanical polishing tool shown in FIG. **1**. As a preferred embodiment, a baffle **13** is arranged at an outlet of the nozzle **1**, and the size of the baffle **13** is smaller than the size of the opening of the nozzle **1**. The baffle **13** can increase the spraying angle for the DI water and extend its spray range, thereby improving the performance of the preheating of the polishing pad.

[0045] The polishing head **7** is arranged above the polishing pad **8**. In the process of CMP, the wafer is mounted on the surface of the polishing pad **8**, with its surface to be planarized faces the polishing pad **8**. Driven by a mechanical drive mechanism **12**, the polishing head **7** presses on a surface of the wafer; meanwhile, the polishing plate drives the polishing pad **8** to rotate, thereby realizing polishing of the wafer.

[0046] The polishing pad conditioner **2** is arranged above the polishing pad **8** via a beam **11**. Driven by the beam **11**, the polishing pad conditioner **2** presses on the polishing pad **8**; meanwhile, the polishing plate drives the polishing pad **8** to rotate, thereby realizing dressing of the polishing pad **8**.

[0047] The heating apparatus **5** heats the DI water fed to the DI water supply channel, to a temperature ranging from room temperature to 60° C. The term "room temperature" denotes a temperature range of 18° C. to 25° C.

[0048] The temperature sensor **6** is arranged close to the polishing pad **8**, to measure the temperature of the polishing pad **8**. In an embodiment, the temperature sensor **6** may be an infrared temperature sensor, arranged in a location on the mechanical drive mechanism **12** connected with the polishing head **7** where is close to the polishing pad **8**.

[0049] The preheating control system **10** is connected to the electrically-controlled valve **4** and the temperature sensor **6** via a signal control line **9**. In an embodiment, the preheating control system **10** may be a computer-based control system. In the beginning of the preheating process, the preheating control system **10** opens a valve member of the electrically-controlled valve **4** corresponding to the DI water supply channel so that the DI water supply channel sprays the DI water heated by the heating apparatus **5** to the polishing pad **8**; while the heated DI water is being sprayed, the preheating control system **10** monitors a temperature signal transmitted from the temperature sensor **6**, and when the temperature of the polishing pad **8** reaches a predetermined temperature, closes the DI water supply channel, specifically, closes the valve member of the electrically-controlled valve **4** corresponding to the DI water supply channel and opens a valve member corresponding to the polishing slurry supply channel so that the polishing slurry supply channel sprays the polishing slurry to the polishing pad **8**, and controls the polishing pad conditioner **2** to dress the polishing pad **8**, so that the surface of the polishing pad **8** quickly reaches its operating condition and the polishing slurry is distributed evenly on the polishing pad **8**. The predetermined temperature ranges from room temperature to 60° C., and the time of the polishing pad conditioner **2** dressing the polishing pad **8** is 20 s to 60 s. When the preheating process ends, product wafers can be mounted on the polishing pad **8**, and batch planarization process starts.

[0050] In an embodiment, the length of the polishing pad conditioner **2** in a radial direction of the polishing pad **8** is equal to or larger than the radius of the polishing pad **8**, that is, the polishing pad conditioner **2** fully covers the radius of the polishing pad **8**. And the dressing process is realized by: driving the polishing pad conditioner **2** by the beam **11** to press on the polishing pad **8**, and driving the polishing pad **8** to rotate.

[0051] Depending on the embodiments, the length of the polishing pad conditioner **2** in a radial direction of the polishing pad **8** may be smaller than the radius of the polishing pad **8**, that is, the polishing pad conditioner **2** does not fully cover the radius of the polishing pad **8**. And the dressing process may be realized by: driving the polishing pad conditioner **2** by the beam **11** to press on the polishing pad **8**, then driving the polishing pad **8** to rotate and driving the polishing pad conditioner **2** to move in a radial direction of the polishing pad **8**, at a constant speed or at a variable speed.

[0052] In the preheating process of the chemical-mechanical polishing tool according to the embodiment, firstly the polishing pad is heated using the heated DI water, then the polishing pad is dressed by the polishing pad conditioner so that the polishing pad quickly reaches its operating condition. The whole preheating process does not consume dummy wafers and has low consumption of polishing slurry and the polishing pad, thereby reducing production cost.

[0053] An embodiment of the present invention also provides a method for preheating a chemical-mechanical polishing tool, the chemical-mechanical polishing tool including a polishing pad and a polishing pad conditioner. As shown in FIG. **3**, the method includes:

[0054] step S**11**, spraying heated DI water to the polishing pad; and

[0055] step S**12**, when a temperature of the polishing pad is equal to or higher than a predetermined temperature, stopping spraying the DI water, spraying polishing slurry to the polishing pad and controlling the polishing pad conditioner to dress the polishing pad.

[0056] Firstly, step S**11** is performed: spraying heated DI water to the polishing pad. The temperature of the DI water ranges from room temperature to 60° C. In an embodiment, the fed DI water may be heated by a heating apparatus. The heating apparatus can be a built-in heating apparatus of a chemical-mechanical polishing tool, e.g. a chemical-mechanical polishing tool according to the embodiment described above. The heating apparatus may also be an exter-

nal heating apparatus, which heats DI water and then provides the heated DI water to a chemical-mechanical polishing tool.

[0057] Then, step S**12** is performed: when a temperature of the polishing pad is equal to or higher than a predetermined temperature, stopping spraying the DI water, spraying polishing slurry to the polishing pad and controlling the polishing pad conditioner to dress the polishing pad. The predetermined temperature in this embodiment may range from room temperature to 60° C., and the dressing time is 20 s to 60 s. After dressing, the surface of the polishing pad quickly reaches its operating condition and the polishing slurry is evenly distributed.

[0058] In an embodiment, the length of the polishing pad conditioner in a radial direction of the polishing pad is equal to or larger than the radius of the polishing pad, that is, the polishing pad conditioner fully covers the radius of the polishing pad. And the dressing process is realized by: pressing the polishing pad conditioner on the polishing pad, and driving the polishing pad to rotate.

[0059] Depending on the embodiments, the length of the polishing pad conditioner in a radial direction of the polishing pad may be smaller than the radius of the polishing pad, that is, the polishing pad conditioner does not fully cover the radius of the polishing pad. And the dressing process may be realized by: pressing the polishing pad conditioner on the polishing pad, then driving the polishing pad to rotate and driving the polishing pad conditioner to move in a radial direction of the polishing pad, at a constant speed or at a variable speed.

[0060] Applications of the chemical-mechanical polishing tool and its preheating method of the embodiment include, but are not limited to, various CMP processes in the integrated circuit industry, e.g., the CMP process in STI, the CMP process in oxide isolation (ILD), the CMP process for tungsten (W), the CMP process for copper (Cu), the CMP process for polysilicon (poly), the CMP process for metal gates, the CMP process for poly opening polish (POP).

[0061] The chemical-mechanical polishing tool of the embodiment can be applied in CMP process for wafers of a variety of sizes, e.g. 8 inches or 12 inches. The method for preheating a chemical-mechanical polishing tool of the embodiment can be applied with CMP tools made by a variety of manufactures or of a variety of types, and hence has good industrial practicability.

[0062] To sum up, the chemical-mechanical polishing tool of the technical solution includes: a polishing pad, a DI water supply channel, a polishing slurry supply channel and a polishing pad conditioner; and the chemical-mechanical polishing tool further includes: a heating apparatus, adapted to heat DI water fed to the DI water supply channel; a temperature sensor, arranged close to the polishing pad to measure a temperature of the polishing pad; and a preheating control system, connected to the temperature sensor, and adapted to control the DI water supply channel to spray the heated DI water to the polishing pad, and when the temperature measured by the temperature sensor is equal to or higher than a predetermined temperature, to close the DI water supply channel, control the polishing slurry supply channel to spray polishing slurry to the polishing pad, and startup the polishing pad conditioner to dress the polishing pad. The chemical-mechanical polishing tool above performs preheating by using the heated DI water and the polishing pad conditioner dressing the polishing pad. Dummy wafers are no longer needed, and consumption of polishing consumables including polishing slurry and the polishing pad is reduced, thereby reducing production cost.

[0063] Furthermore, the chemical-mechanical polishing tool of the technical solution has a nozzle arranged at an end of the DI water supply channel and a baffle arranged at an outlet of the nozzle, so that the spray range for the DI water can be increased, thereby improving preheating performance.

[0064] The method for preheating a chemical-mechanical polishing tool of the technical solution includes: firstly, spraying heated DI water to the polishing pad; and when a temperature of the polishing pad is equal to or higher than a predetermined temperature, stopping spraying the DI water, spraying polishing slurry to the polishing pad and controlling the polishing pad conditioner to dress the polishing pad. The method above firstly heats the polishing pad using the heated DI water, then dresses the polishing pad by the polishing pad conditioner so that the polishing pad quickly reaches its operating condition. Dummy wafers are no longer needed, and consumption of polishing consumables including polishing slurry and the polishing pad is reduced, thereby reducing production cost.

[0065] The present invention is disclosed above in connection with the preferred embodiments. It should be noted that the embodiments disclosed herein should not be interpreted as limiting the scope of the invention. Alternations and modifications may be made to the technical solution of the invention by those skilled in the art without deviation from the scope of the invention. Hence, any modifications, equivalents and alterations made based on the technical principle of the present invention without deviation from the scope of the invention should fail within the scope of protection of the invention.

1. A chemical-mechanical polishing (CMP) tool, comprising: a polishing pad, a deionized (DI) water supply channel, a polishing slurry supply channel and a polishing pad conditioner, wherein, the CMP tool further comprises:

a heating apparatus, adapted to heat DI water fed to the DI water supply channel;

a temperature sensor, arranged close to the polishing pad to measure a temperature of the polishing pad; and

a preheating control system, connected to the temperature sensor, and adapted to control the DI water supply channel to spray the heated DI water to the polishing pad, and when the temperature measured by the temperature sensor is equal to or higher than a predetermined temperature, to close the DI water supply channel, control the polishing slurry supply channel to spray polishing slurry to the polishing pad, and startup the polishing pad conditioner to dress the polishing pad.

2. The CMP tool according to claim **1**, wherein, the heating apparatus is adapted to heat the DI water to a temperature ranging from room temperature to 60° C.

3. The CMP tool according to claim **1**, wherein, a nozzle is arranged at an end of the DI water supply channel, and a baffle is arranged at an outlet of the nozzle.

4. The CMP tool according to claim **1**, wherein, the predetermined temperature ranges from room temperature to 60° C.

5. The CMP tool according to claim **1**, wherein, the preheating control system is adapted to control the polishing pad conditioner to dress the polishing pad for 20 s to 60 s.

6. The CMP tool according to claim **1**, wherein, the length of the polishing pad conditioner in a radial direction of the polishing pad is equal to or larger than a radius of the polishing pad.

7. The CMP tool according to claim **1**, wherein, the length of the polishing pad conditioner in a radial direction of the polishing pad is smaller than a radius of the polishing pad.

8. The CMP tool according to claim **7**, wherein, the preheating control system is adapted to control the polishing pad conditioner to move in a radial direction of the polishing pad, to realize dressing of the polishing pad.

9. The CMP tool according to claim **8**, wherein, the preheating control system is adapted to control the polishing pad conditioner to move in the radial direction of the polishing pad at a constant speed or a variable speed.

10. The CMP tool according to claim **1**, wherein, an electrically-controlled valve is arranged in the DI water supply channel and the polishing slurry supply channel, and the electrically-controlled valve is connected with the preheating control system and controlled by the preheating control system.

11. A method for preheating a chemical-mechanical polishing (CMP) tool, the CMP tool comprising a polishing pad and a polishing pad conditioner, wherein, the method comprises:

spraying heated deionized (DI) water to the polishing pad; and

when a temperature of the polishing pad is equal to or higher than a predetermined temperature, stopping spraying the DI water, spraying polishing slurry to the polishing pad and controlling the polishing pad conditioner to dress the polishing pad.

12. The method for preheating a CMP tool according to claim **11**, wherein, the heated DI water has a temperature ranging from room temperature to 60° C.

13. The method for preheating a CMP tool according to claim **11**, wherein, the predetermined temperature ranges from room temperature to 60° C.

14. The method for preheating a CMP tool according to claim **11**, wherein, the time of the polishing pad conditioner dressing the polishing pad ranges from 20 s to 60 s.

15. The method for preheating a CMP tool according to claim **11**, wherein, the length of the polishing pad conditioner in a radial direction of the polishing pad is equal to or larger than a radius of the polishing pad, and the polishing pad conditioner dressing the polishing pad comprises: pressing the polishing pad conditioner on the polishing pad, and driving the polishing pad to rotate.

16. The method for preheating a CMP tool according to claim **11**, wherein, the length of the polishing pad conditioner in a radial direction of the polishing pad is smaller than a radius of the polishing pad, and the polishing pad conditioner dressing the polishing pad comprises: pressing the polishing pad conditioner on the polishing pad, driving the polishing pad to rotate, and driving the polishing pad conditioner to move in a radial direction of the polishing pad.

17. The method for preheating a CMP tool according to claim **16**, wherein, the polishing pad conditioner moves in the radial direction of the polishing pad at a constant speed or a variable speed.

* * * * *