CLAIMS

1. A method for processing a semiconductor structure, comprising:

providing a semiconductor structure, the semiconductor structure comprising a substrate and a plurality of etched structures arranged on a surface area of the substrate; wherein the plurality of etched structures are trenches, and number of the trenches arranged on the surface area of the substrate is more than one, and ratio of depth of each of the trenches to minimum width of each of the trenches is greater than 8;

forming a transition layer at least covering inner walls of the plurality of etched structures, the transition layer being configured to reduce a capillary force exerted by a fluid on the etched structures and to serve as a sacrificial layer configured to repair a collapsed structure;

wherein the forming a transition layer at least covering inner walls of the plurality of etched structures comprises:

oxidizing the semiconductor structure to form an oxide layer at least covering inner walls of the trenches, the oxide layer being the transition layer;

drying the semiconductor structure; and

removing the transition layer after drying the semiconductor structure;

wherein the removing the transition layer comprises:

removing the transition layer by means of a mixed gas comprising hydrogen fluoride and ammonia gas as etching gas;

wherein flow ratio of the hydrogen fluoride to the ammonia gas is (1~2):1; flow rate of the hydrogen fluoride and the ammonia gas is 10 sccm~300 sccm, temperature is 20°C~150°C, and duration is 1 s~60 s, pressure in a processing chamber is 1 mtorr~5,000 mtorr, and temperature of a support platform is 20°C~150°C;

wherein providing the semiconductor structure comprises:

providing the substrate;

etching the substrate to form the trenches on the surface area of the substrate, bottoms of the trenches extending into the substrate to form the semiconductor structure; and

cleaning the semiconductor structure to remove impurities generated after the trenches are formed by the etching;

wherein cleaning the semiconductor structure comprises:

processing the semiconductor structure by means of a plasma ashing process to remove polymer residue generated after the trenches are formed by the etching; and

processing the semiconductor structure by means of a wet cleaning process to remove byproduct and pollutant generated after the etching and the plasma ashing processes;

wherein processing the semiconductor structure by means of a plasma ashing process comprises:

performing the plasma ashing process on a surface of the semiconductor structure by means of simultaneously introducing plasmonized oxygen and a mixed gas composed of hydrogen and nitrogen to remove the polymer residue generated after the trenches are formed by the etching, wherein flow rate of the oxygen is 5,000ml/min~30,000ml/min, flow rate of the mixed gas composed of the hydrogen and the nitrogen is 500ml/min~3,000ml/min, temperature is 100°C~500°C, duration is 10s~120s, pressure in the processing chamber is 200 mtorr~5,000 mtorr, and radio frequency power is 1,000 W~10,000 W;

wherein in the wet cleaning process, cleaning agent is diluted HF, volume ratio of 49% HF liquid to deionized water is 1: (1-1000), duration is 5s~600s, temperature is 15°C~60°C, and rotation speed of the support platform is 100rpm~3,000rpm;

wherein a total thickness of the substrate and the transition layer removed by the etching by means of the mixed gas comprising the hydrogen fluoride and the ammonia gas as the etching gas is 1nm to 10nm.

2. The method for processing a semiconductor structure according to claim 1, wherein the trenches are arranged in parallel on the surface area of the substrate; and

wherein width of pattern line between two adjacent ones of the trenches is less than 20 nm.

3. The method for processing a semiconductor structure according to claim 1, wherein oxidizing the semiconductor structure comprises:

processing the semiconductor structure by means of an oxidizing liquid, the oxidizing liquid at least filling up the trenches, and the oxidizing liquid being an ozone deionized aqueous solution or a mixed solution of ammonia water and hydrogen peroxide.

4. The method for processing a semiconductor structure according to claim 3, wherein processing the semiconductor structure by mean of an oxidizing liquid comprises:

spraying the oxidizing liquid to a surface of the rotating semiconductor structure to rinse the semiconductor structure.

5. The method for processing a semiconductor structure according to claim 1, wherein the oxide layer has a thickness of 2Å to 12Å.

6. The method for processing a semiconductor structure according to claim 1, wherein drying the semiconductor structure comprises:

processing the semiconductor structure by means of isopropanol at a preset temperature to remove moisture on a surface area of the semiconductor structure.

7. The method for processing a semiconductor structure according to claim 1, wherein after removing the transition layer, the method further comprises:

purging the semiconductor structure by means of a gas.