CLAIMS

1. A method of wetting a semiconductor substrate, the method comprising:

forming a carbon dioxide atmosphere in a processing chamber housing the semiconductor substrate, wherein the semiconductor substrate defines a plurality of features;

flowing a wetting agent into the processing chamber while maintaining the carbon dioxide atmosphere, wherein a chamber pressure is maintained below about 100 kPa during the flowing; and

wetting the plurality of features defined in the substrate.

2. The method of wetting a semiconductor substrate of claim 1, further comprising:

pressurizing the processing chamber to about atmospheric conditions; and

maintaining the wetting agent in contact with the plurality of features for a period of time subsequent pressurizing the processing chamber.

3. The method of wetting a semiconductor substrate of claim 2, wherein the period of time is less than about one minute.

4. The method of wetting a semiconductor substrate of claim 1, wherein the substrate defines at least 1,000 features, and wherein less than 5% of the features contain a bubble defect in the wetting agent.

5. The method of wetting a semiconductor substrate of claim 1, wherein the carbon dioxide atmosphere is formed by a continuous purge of carbon dioxide, a pump down and backfill of carbon dioxide, a carbon dioxide replacement operation, or by a load lock transfer process into a carbon dioxide environment.

6. The method of wetting a semiconductor substrate of claim 1, wherein the carbon dioxide atmosphere comprises greater than 50% carbon dioxide.

7. The method of wetting a semiconductor substrate of claim 1, wherein the plurality of features comprise vias formed in the semiconductor substrate, and wherein at least one via is characterized by a diameter of at least about 20 μm.

8. The method of wetting a semiconductor substrate of claim 1, wherein the wetting agent comprises degassed deionized water.

9. The method of wetting a semiconductor substrate of claim 8, wherein the degassed deionized water is degassed below about 20 ppm.

10. The method of wetting a semiconductor substrate of claim 1, wherein the wetting agent is flowed into the processing chamber by a gravity-induced flow, a forced flow, or a spray.

11. The method of wetting a semiconductor substrate of claim 1, wherein the chamber pressure is maintained below about 20 kPa during delivery of the wetting agent into the chamber.

12. The method of wetting a semiconductor substrate of claim 1, wherein the wetting agent absorbs over 98% of carbon dioxide residing in the plurality of features defined by the substrate.

13. A method of wetting a semiconductor substrate, the method comprising:

forming a controlled atmosphere in a processing chamber housing the semiconductor substrate, wherein the semiconductor substrate defines a plurality of vias including at least one via characterized by a diameter greater than about 50 μm, and wherein the controlled atmosphere comprises one or more fluids selected from the group consisting of carbon dioxide, carbon monoxide, oxygen, nitrogen, argon, ammonia, bromine, diazene, acetylene, krypton, xenon, radon, nitrous oxide, hydrogen selenide, and hydrocarbons;

reducing a pressure within the processing chamber to below about 10 kPa;

flowing a wetting agent into the processing chamber while maintaining the controlled atmophere;

pressurizing the processing chamber above about 50 kPa; and

wetting the plurality of vias defined on the semiconductor substrate, wherein less than 1% of the vias contain a defect in the wetting.

14. The method of wetting a semiconductor substrate of claim 13, wherein the wetting agent comprises water.

15. The method of wetting a semiconductor substrate of claim 13, wherein, subsequent the pressurizing, the chamber is maintained at a pressure above about 50 kPa for a period of time.

16. The method of wetting a semiconductor substrate of claim 15, wherein the period of time is between about 1 second and about 20 seconds.

17. A method of wetting a substrate, the method comprising:

providing a substrate to a processing chamber, wherein the substrate defines a plurality of features;

displacing air from the plurality of features defined in the substrate, wherein the air is displaced with carbon dioxide;

spraying deionized water into the processing chamber, wherein the deionized water is degassed below about 5 ppm, and wherein the spraying occurs while maintaining a pressure within the processing chamber below about 100 kPa with the carbon dioxide;

pressurizing the processing chamber above about 50 kPa for a period of time; and

wetting the plurality of features defined on the substrate, wherein greater than 99% of the carbon dioxide is removed from the features.

18. The method of wetting a substrate of claim 17, wherein pressurizing the processing chamber raises the pressure above about 90 kPa.

19. The method of wetting a substrate of claim 17, wherein the substrate defines over one million features, and wherein less than 0.01% of features of the plurality of features are characterized by a defect comprising a bubble within the deionized water.