

What is claimed is:

1. A substrate cleaning apparatus comprising:
a substrate holder configured to hold a substrate; and
a two-fluid nozzle configured to deliver a two-fluid jet onto a surface of the
5 substrate,
wherein the two-fluid nozzle includes:
a liquid container having a liquid chamber and a liquid introduction port in
communication with the liquid chamber,
a first jet nozzle in communication with the liquid chamber and having a first gas
10 introduction port, the first jet nozzle being configured to emit a first two-fluid jet, and
a second jet nozzle in communication with the liquid chamber and having a
second gas introduction port, the second jet nozzle being configured to emit a second
two-fluid jet at a velocity higher than a velocity of the first two-fluid jet, the second jet
nozzle surrounding the first jet nozzle.
- 15 2. The substrate cleaning apparatus according to claim 1, wherein the velocity of
the second two-fluid jet is not less than a speed of sound.
3. The substrate cleaning apparatus according to claim 1, further comprising:
a nozzle moving mechanism configured to move the two-fluid nozzle in a radial
direction of the substrate.
- 20 4. The substrate cleaning apparatus according to claim 1, further comprising:
a distance adjuster configured to change a distance between the two-fluid nozzle
and the surface of the substrate.
5. The substrate cleaning apparatus according to claim 1, further comprising:
a third jet nozzle disposed inside the first jet nozzle and configured to emit a third
25 two-fluid jet at a velocity higher than the velocity of the first two-fluid jet.
6. The substrate cleaning apparatus according to claim 5, wherein the velocity of
the third two-fluid jet is not less than a speed of sound.

7. A substrate cleaning apparatus comprising:
- a substrate holder configured to hold a substrate; and
 - a two-fluid nozzle configured to deliver a two-fluid jet onto a surface of the substrate,
- 5 wherein the two-fluid nozzle includes:
- a liquid container having a liquid chamber and a liquid introduction port in communication with the liquid chamber,
 - a first jet nozzle in communication with the liquid chamber and having a first gas introduction port, the first jet nozzle being configured to emit a two-fluid jet, and
- 10 a second jet nozzle having a second gas introduction port, the second jet nozzle being configured to emit a gas jet at a velocity higher than a velocity of the two fluid jet, the second jet nozzle surrounding the first jet nozzle.

8. The substrate cleaning apparatus according to claim 7, wherein the first jet nozzle comprises at least two inlets, the at least two inlets comprising the first gas introduction port and a first liquid inlet.

9. The substrate cleaning apparatus according to claim 8, wherein the first jet nozzle is in communication with the liquid chamber via the first liquid inlet.

10. The substrate cleaning apparatus according to claim 1, wherein:
the first jet nozzle comprises at least two inlets, the at least two inlets comprising the first gas introduction port and a first liquid inlet, and
the second jet nozzle comprises at least two other inlets, the at least two other inlets comprising the second gas introduction port and a second liquid inlet.

11. The substrate cleaning apparatus according to claim 10, wherein:
the first jet nozzle is in communication with the liquid chamber via the first liquid inlet, and
the second jet nozzle is in communication with the liquid chamber via the second liquid inlet.

12. A two-fluid nozzle for use in a substrate cleaning apparatus, comprising:
a liquid container having a liquid chamber and a liquid introduction port in communication with the liquid chamber,
a first jet nozzle in communication with the liquid chamber and having a first gas introduction port, the first jet nozzle being configured to emit a first two-fluid jet, and
a second jet nozzle in communication with the liquid chamber and having a second gas introduction port, the second jet nozzle being configured to emit a second two-fluid jet at a velocity higher than a velocity of the first two-fluid jet, the second jet nozzle surrounding the first jet nozzle.