

CLAIMS

1. A method, comprising:
chemically altering a Josephson junction of a Josephson junction resonator via a plasma treatment; and
selectively tuning an operating frequency of the Josephson junction resonator based on a property of the plasma treatment.
2. The method according to the preceding claim, wherein the property is at least one member selected from the group consisting of: a processing time of the plasma treatment, a chemical composition of the plasma treatment, an amount of energy delivered to the Josephson junction by the plasma treatment, and a partial pressure of a gas employed by the plasma treatment.
3. The method according to any of the preceding claims, wherein the plasma treatment exposes the Josephson junction to a series of plasmas, and wherein the plasma treatment alters an electrical resistance of the Josephson junction.
4. The method according to any of the preceding claims, further comprising:
localizing the plasma treatment to a proximity of the Josephson junction via a plasma beam.
5. The method according to any of the preceding claims, further comprising:
depositing a mask layer onto the Josephson junction resonator, wherein the mask layer comprises a hole that correlates to a position of the Josephson junction, and wherein the mask layer protects a second Josephson junction from the plasma treatment.
6. The method according to the preceding claim, wherein the mask layer comprises a first surface facing the Josephson junction and a second surface facing the plasma treatment, wherein the first surface is characterized by a chemical composition that absorbs a plasma species of the plasma treatment, and wherein the second surface is characterized by another chemical composition that is inert to the plasma treatment.

7. The method according to any of the two preceding claims, further comprising:
patterning an electrode at a perimeter of the hole in the mask layer, and
controlling migration of a reactive species of the plasma treatment across the mask layer via operation of the electrode.
8. The method according to any of the preceding claims, further comprising:
compressing an inert gasket onto the Josephson junction resonator, wherein the inert gasket comprises a hole that correlates to a position of the Josephson junction, and
wherein the inert gasket seals a second Josephson junction neighboring the Josephson junction from the plasma treatment.
9. A method, comprising:
chemically altering a Josephson junction of a Josephson junction resonator via a plasma treatment; and
adjusting an electrical resistance of the Josephson junction based on a property of the plasma treatment.
10. The method according to the preceding claim, wherein the plasma treatment exposes the Josephson junction to a series of plasmas, wherein the plasma treatment alters the electrical resistance of the Josephson junction, and wherein the property is at least one member selected from the group consisting of a processing time of the plasma treatment, a chemical composition of the plasma treatment, an amount of energy delivered to the Josephson junction by the plasma treatment, and a partial pressure of a gas employed by the plasma treatment.
11. The method according to any of the two preceding claims, further comprising:
localizing the plasma treatment to a proximity of the Josephson junction via a plasma beam.
12. The method according to any of the three preceding claims, further comprising:
depositing a mask layer onto the Josephson junction resonator, wherein the mask layer comprises a hole that correlates to a position of the Josephson junction, and wherein

the mask layer protects a portion of the Josephson junction resonator from the plasma treatment.

13. The method according to the preceding claim, wherein the mask layer comprises a first surface facing the Josephson junction resonator and a second surface facing the plasma treatment, wherein the first surface is characterized by a chemical composition that absorbs a plasma species of the plasma treatment, and wherein the second surface is characterized by another chemical composition that is inert to the plasma treatment.

14. The method according to any of the five preceding claims, further comprising: compressing an inert gasket onto the Josephson junction resonator, wherein the inert gasket comprises a hole that correlates to a position of the Josephson junction, and wherein the inert gasket seals a second Josephson junction neighboring the Josephson junction from the plasma treatment.

15. A method, comprising:
exposing a Josephson junction of a Josephson junction resonator to a plasma treatment, wherein the plasma treatment tunes an operating frequency of the Josephson junction resonator to a target operating frequency by altering an electrical resistance of the Josephson junction.

16. The method according to the preceding claim, wherein the plasma treatment exposes the Josephson junction to a series of plasmas.

17. The method according to any of the two preceding claims, further comprising: shielding a second Josephson junction from the plasma treatment, wherein the second Josephson junction neighbors the Josephson junction of the Josephson junction resonator.

18. The method according to any of the three preceding claims, further comprising: localizing the plasma treatment to a proximity of the Josephson junction via a plasma beam.

19. An apparatus, comprising:
an actuator operably coupled to a cover sheet that comprises a hole positioned over a platform configured to structurally support a Josephson junction resonator die.
20. The apparatus according to the preceding claim, wherein the cover sheet comprises at least one member selected from the group consisting of: stainless steel, steel, molybdenum, brass, beryllium copper, glass, quartz, ceramic, and copper.
21. The apparatus according to any of the two preceding claims, further comprising:
a guide housing positioned adjacent to the cover sheet and configured to guide a motion of the cover sheet that is initiated by the actuator.
22. A system, comprising:
an actuator operably coupled to a cover sheet that comprises a hole; and
a computer readable storage medium having program instructions embodied therewith, the program instructions executable by a processor to cause the processor to:
control, by the processor, operation of the actuator such that the actuator adjusts a position of the hole with respect to a Josephson junction located on a Josephson junction resonator die shielded by the cover sheet.
23. The system according to the preceding claim, wherein the program instructions further cause the processor to:
control, by the processor, operation of the actuator such that the actuator aligns the hole of the cover sheet with the Josephson junction.
24. The system according to any of the two preceding claims, wherein the program instructions further cause the processor to:
control, by the processor, operation of the actuator such that the cover sheet moves along a plane parallel to a surface of the Josephson junction resonator die, wherein the Josephson junction is located on the surface.

25. The system according to any of the three preceding claims, wherein the processor controls operation of the actuator based on execution of a plasma treatment applied to the Josephson junction.